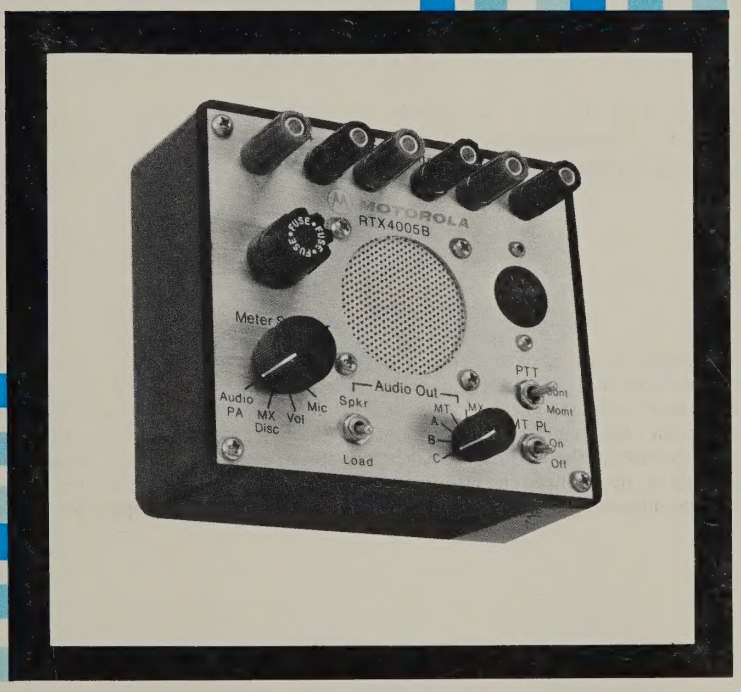
MOTOROLA
test equipment

PORTABLE RADIO TEST SET



RTX-4005B

68P80309B90-O

MOTOROLA TEST EQUIPMENT PRODUCTS
LIMITED WARRANTY
(EXCLUDES EXPORT SHIPMENTS)

Motorola Test Equipment Products (herein the "product") that are manufactured or distributed by Motorola Communications Group Parts Department are warranted by Motorola for a period of one (1) year from date of shipment against defects in material and workmanship.

This express warranty is extended to the original purchaser only. In the event of a defect, malfunction, or failure during the period of warranty, Motorola, at its option, will either repair, or replace the product providing that Motorola receives written notice specifying the nature of the defect during the period of warranty, and the defective product is returned to Motorola at 1313 East Algonquin Road, Schaumburg, IL 60196 transportation prepaid. Proof of purchase and evidence of date of shipment (packing list or invoice) must accompany the return of the defective product. Transportation charges for the return of the product to Purchaser shall be prepaid by Motorola.

This warranty is void, as determined in the reasonable judgement of Motorola, if:

(a) The product has not been operated in accordance with the procedures described in the operating instruction;

(b) The seals on non-user serviceable components or modules are broken;

(c) The product has been subject to misuse, abuse, damage, accident, negligence, repair or alteration.

In no event shall Motorola be liable for any special, incidental, or consequential damages.

In the event Motorola elects to repair a defective product by replacing a module or subassembly, Motorola, at its option, may replace such defective module or subassembly with a new or reconditioned replacement module or subassembly. Only the unexpired warranty of the warranty product will remain in force on the replacement module or subassembly. EXCEPT AS SPECIFICALLY SET FORTH HEREIN. ALL WARRANTIES EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY, ARE EXCLUDED.

EPS-30828-O

SUPPORT SERVICES

For service on your Motorola test equipment in the U.S. contact the Test Equipment Service Center, Schaumburg, 1313 E. Algonquin Rd., Schaumburg, Illinois 60196 or call the Test Equipment Service Hotline: 800/232-6967 during normal business hours. In Illinois call 1-312-576-7025. Outside the U.S. contact your nearest Motorola representative.

EPS-37390-O

EPS-34440-B

ASSEMBLY PROCEDURE FOR 15, 19, 24 dBi MICROWAVE ANTENNA

NOTE: IT IS RECOMMENDED THAT THE ASSEMBLY IS COMPLETED UP TO STEP 4 BEFORE CLIMBING TO THE MOUNT LOCATION

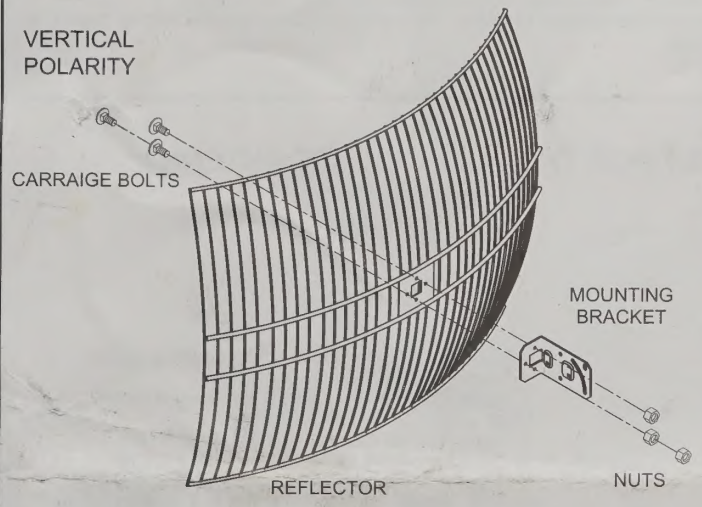
WARNING!! YOU CAN BE KILLED! DO NOT INSTALL NEAR POWER LINES. SERIOUS ELECTROCUTION HAZARD EXISTS.

1

ASSEMBLE THE REFLECTOR TO THE MOUNTING BRACKET IN THE REQUIRED POLARITY.

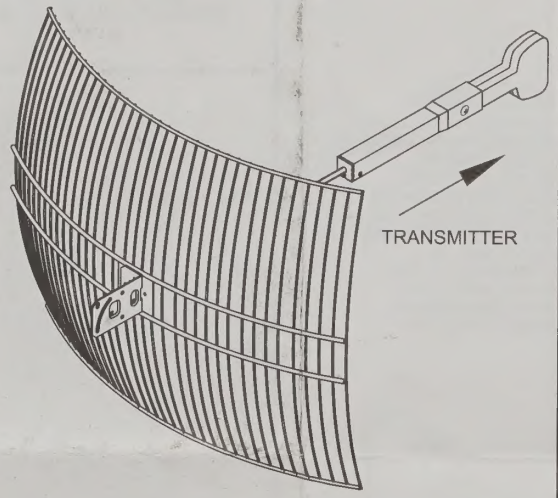
NOTE: THE MOUNTING BRACKET IS TO BE ORIENTED TO ALLOW THE ANTENNA TO BE TILTED TO LINE UP WITH THE TRANSMITTER. ENSURE THE BRACKET IS MOUNTED AS SHOWN.

VERTICAL POLARITY



NOTE: WHEN ASSEMBLING THE DIPOLE AND THE REFLECTOR ASSEMBLY, ENSURE THEY ARE CORRECTLY ORIENTED AS PER THE DRAWINGS BELOW.

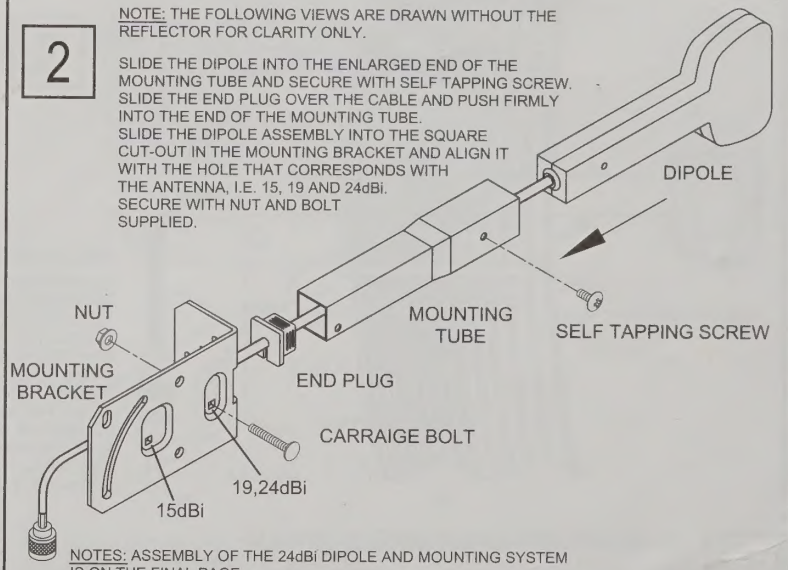
VERTICAL POLARITY



2

NOTE: THE FOLLOWING VIEWS ARE DRAWN WITHOUT THE REFLECTOR FOR CLARITY ONLY.

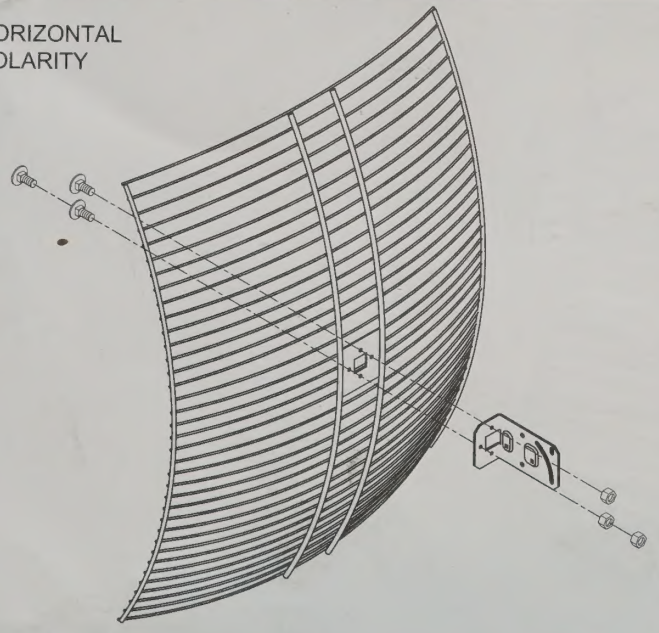
SLIDE THE DIPOLE INTO THE ENLARGED END OF THE MOUNTING TUBE AND SECURE WITH SELF TAPPING SCREW. SLIDE THE END PLUG OVER THE CABLE AND PUSH FIRMLY INTO THE END OF THE MOUNTING TUBE. SLIDE THE DIPOLE ASSEMBLY INTO THE SQUARE CUT-OUT IN THE MOUNTING BRACKET AND ALIGN IT WITH THE HOLE THAT CORRESPONDS WITH THE ANTENNA, I.E. 15, 19 AND 24dBi. SECURE WITH NUT AND BOLT SUPPLIED.



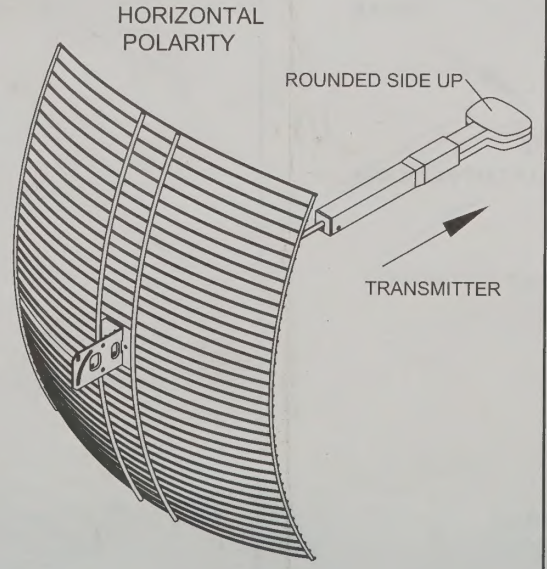
NOTES: ASSEMBLY OF THE 24dBi DIPOLE AND MOUNTING SYSTEM IS ON THE FINAL PAGE.

SLOT IN END PLUG MUST FACE DOWNWARDS.

HORIZONTAL POLARITY

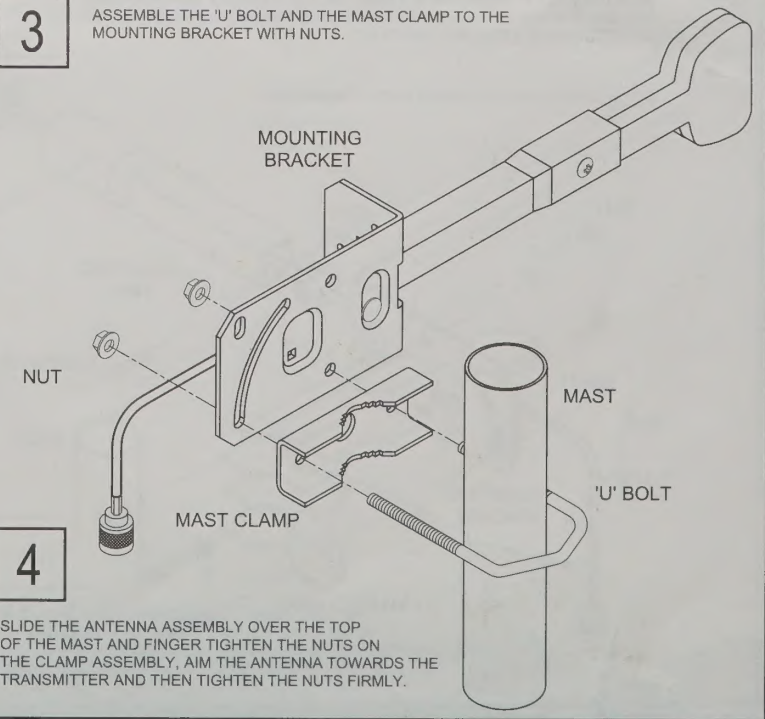


HORIZONTAL POLARITY



3

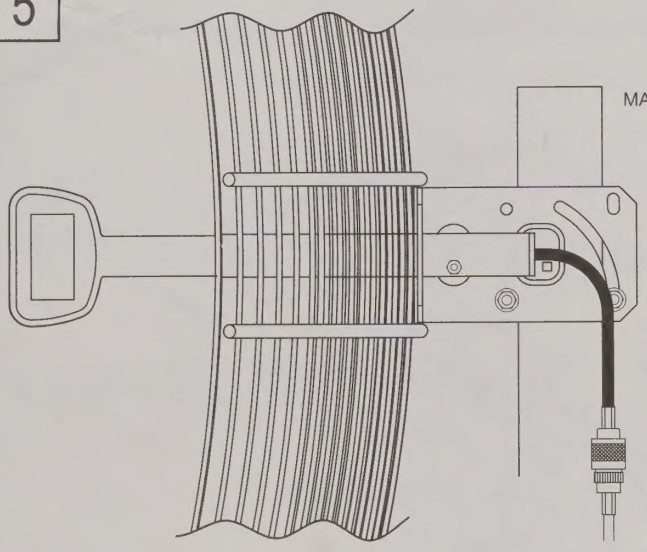
ASSEMBLE THE 'U' BOLT AND THE MAST CLAMP TO THE MOUNTING BRACKET WITH NUTS.



4

SLIDE THE ANTENNA ASSEMBLY OVER THE TOP OF THE MAST AND FINGER TIGHTEN THE NUTS ON THE CLAMP ASSEMBLY, AIM THE ANTENNA TOWARDS THE TRANSMITTER AND THEN TIGHTEN THE NUTS FIRMLY.

5 CABLE LAYOUT



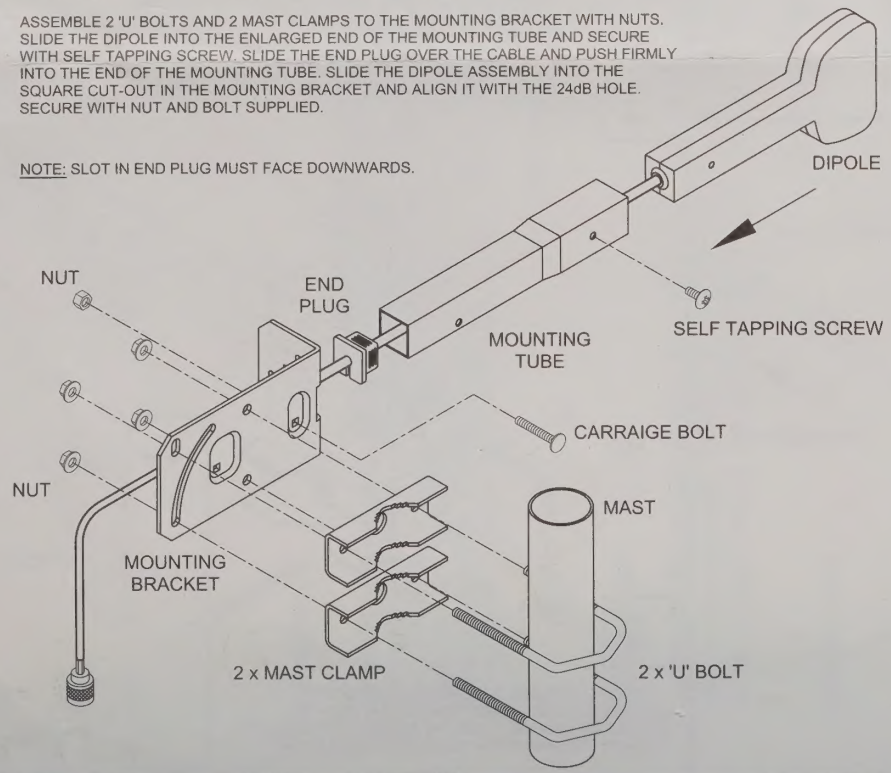
WEATHERPROOF CONNECTION:

ENSURE CABLE CONNECTION TO DOWNLEAD IS WEATHERPROOF. USE SELF AMALGAMATING TAPE. REMOVE PROTECTIVE COATING FROM TAPE. STARTING AT DOWNWARD SIDE OF THE CABLE, SPIRAL TAPE TIGHTLY UPWARD, TERMINATING TAPE DIRECTLY TO CABLE ABOVE THE SHRINK TUBING ON CONNECTOR. AFTER APPLYING SELF AMALGAMATING TAPE, APPLY VINYL ELECTRICAL TAPE IN SAME FASHION, SPIRALING FROM BOTTOM TO TOP.

6 24dBI MOUNTING AND DIPOLE LAYOUT

ASSEMBLE 2 'U' BOLTS AND 2 MAST CLAMPS TO THE MOUNTING BRACKET WITH NUTS. SLIDE THE DIPOLE INTO THE ENLARGED END OF THE MOUNTING TUBE AND SECURE WITH SELF TAPPING SCREW. SLIDE THE END PLUG OVER THE CABLE AND PUSH FIRMLY INTO THE END OF THE MOUNTING TUBE. SLIDE THE DIPOLE ASSEMBLY INTO THE SQUARE CUT-OUT IN THE MOUNTING BRACKET AND ALIGN IT WITH THE 24dB HOLE. SECURE WITH NUT AND BOLT SUPPLIED.

NOTE: SLOT IN END PLUG MUST FACE DOWNWARDS.



NOTES ON DIPOLE WITH INTEGRATED CONNECTOR

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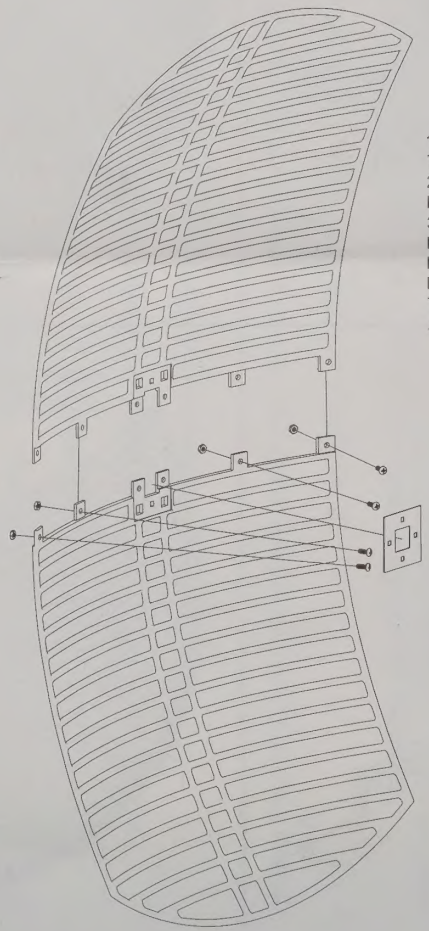
3. NO END PLUG IS NEEDED FOR THE INTEGRATED DIPOLE.
4. THE INTEGRATED CONNECTOR SHOULD ALWAYS BE POINTING DOWN FOR HORIZONTAL POLARITY OR LEFT/RIGHT FOR VERTICAL POLARITY. THE CONNECTOR SHOULD NEVER BE POINTED UP.
5. THE CABLE IS ROUTED THROUGH THE REFLECTOR (NEAR THE CENTER) AND THEN ATTACHED TO THE DIPOLE INTEGRATED CONNECTOR.

PRE-ASSEMBLY FOR THE 24dBi DIECAST ANTENNA



1. COMBINE THE 2 REFLECTOR HALVES BY ALIGNING THE INTERLOCKING TABS.
2. INSERT THE FOUR (4) SCREWS AND TIGHTEN THE LOCK NUTS.
3. PLACE THE DIE CAST WASHER PLATE ON THE FRONT SIDE OF THE REFLECTOR AS THE BRACKET IS INSTALLED IN THE NEXT STEP. THE WASHER PLATE IS POSITIONED ON THE FRONT OF THE ANTENNA AND THE BRACKET IS POSITIONED ON THE BACK OF THE ANTENNA.

ASSEMBLY PROCEDURE FOR 15, 19, 24 dBi MICROWAVE ANTENNA

NOTE: IT IS RECOMMENDED THAT THE ASSEMBLY IS COMPLETED UP TO STEP 4 BEFORE CLIMBING TO THE MOUNT LOCATION

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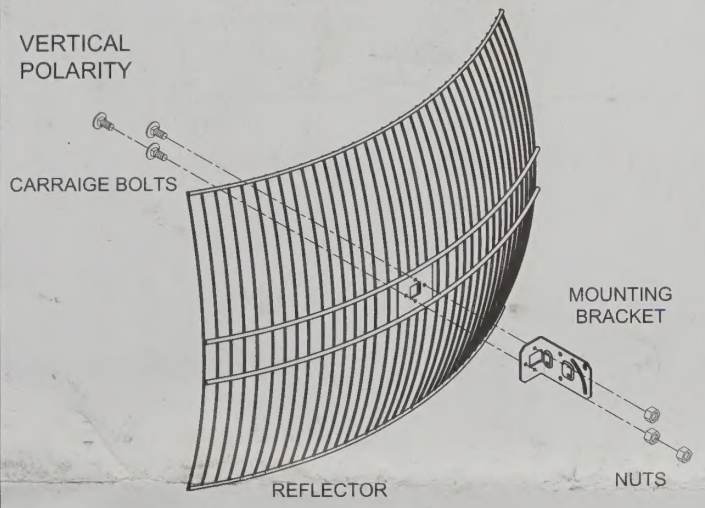

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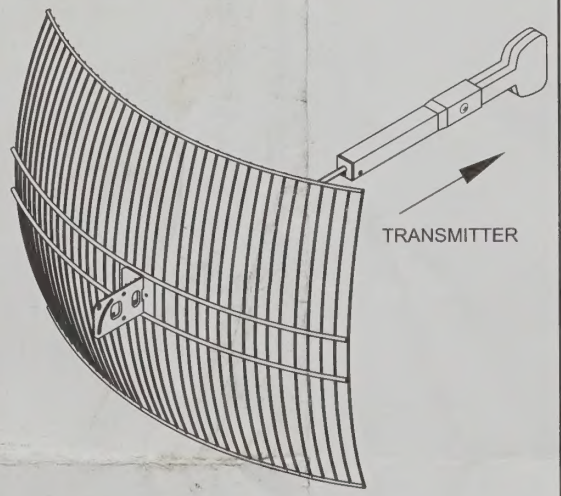

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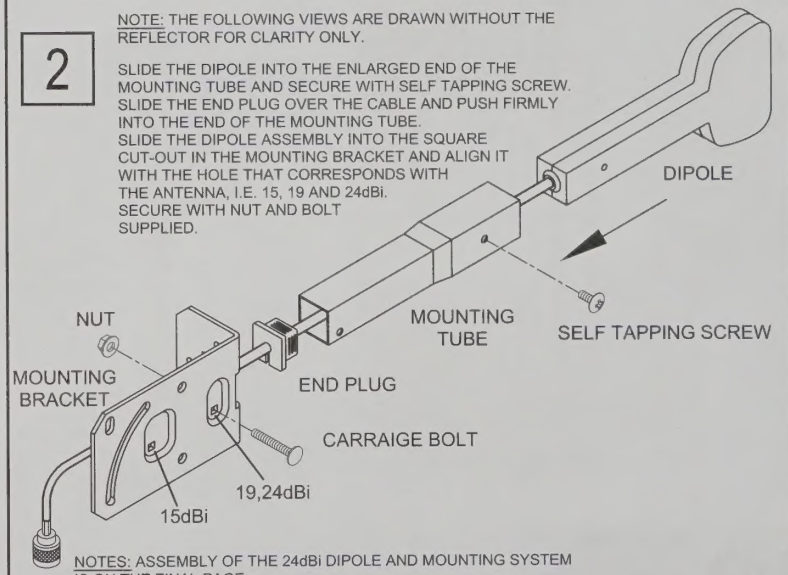

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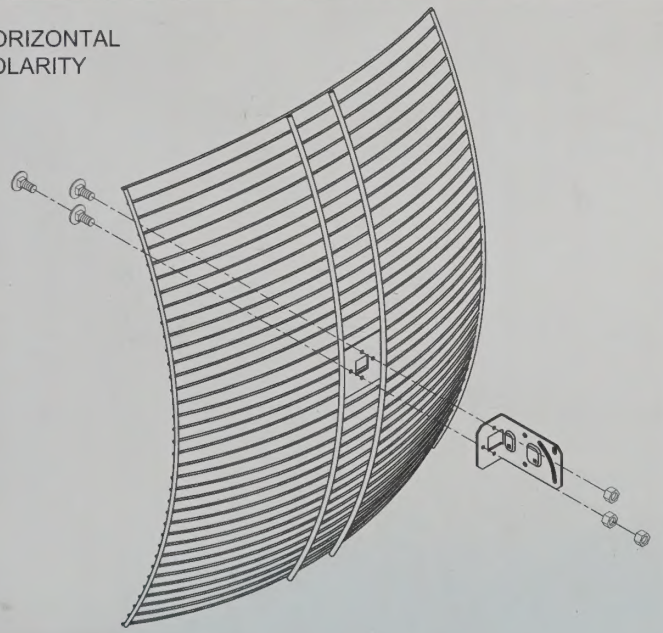

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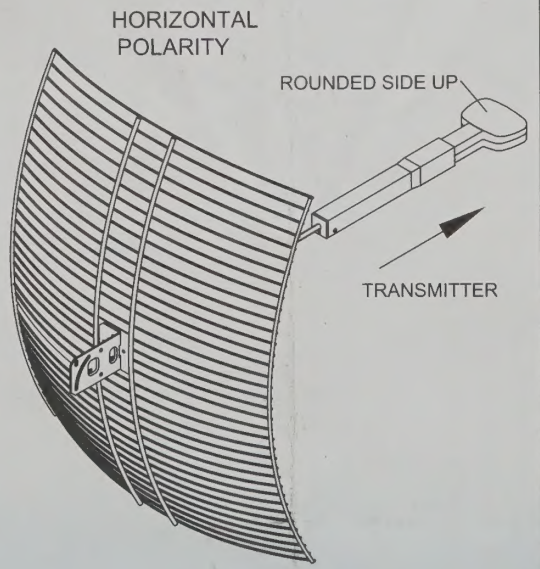

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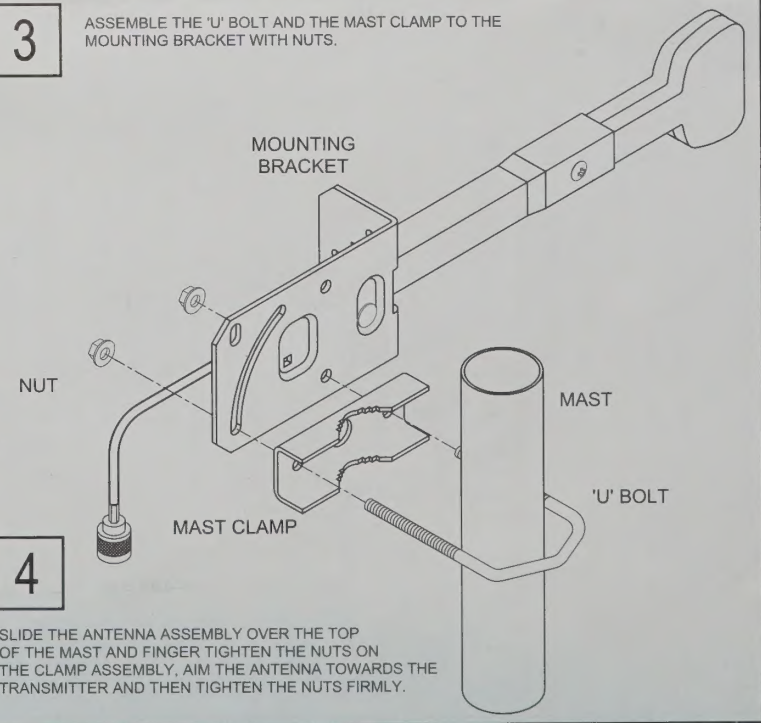

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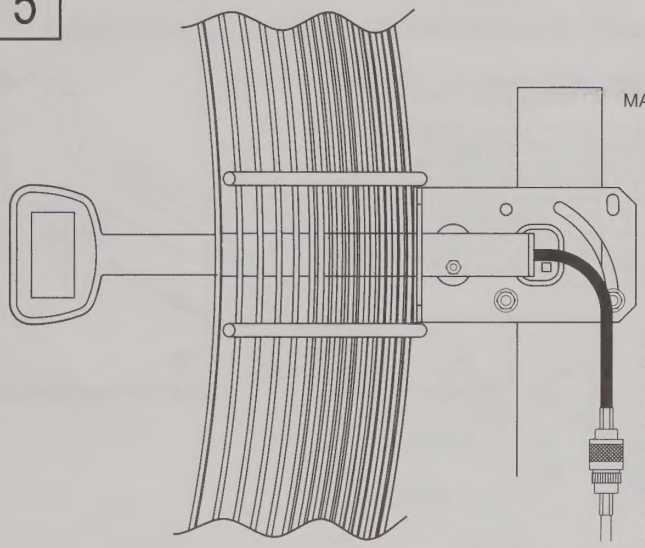

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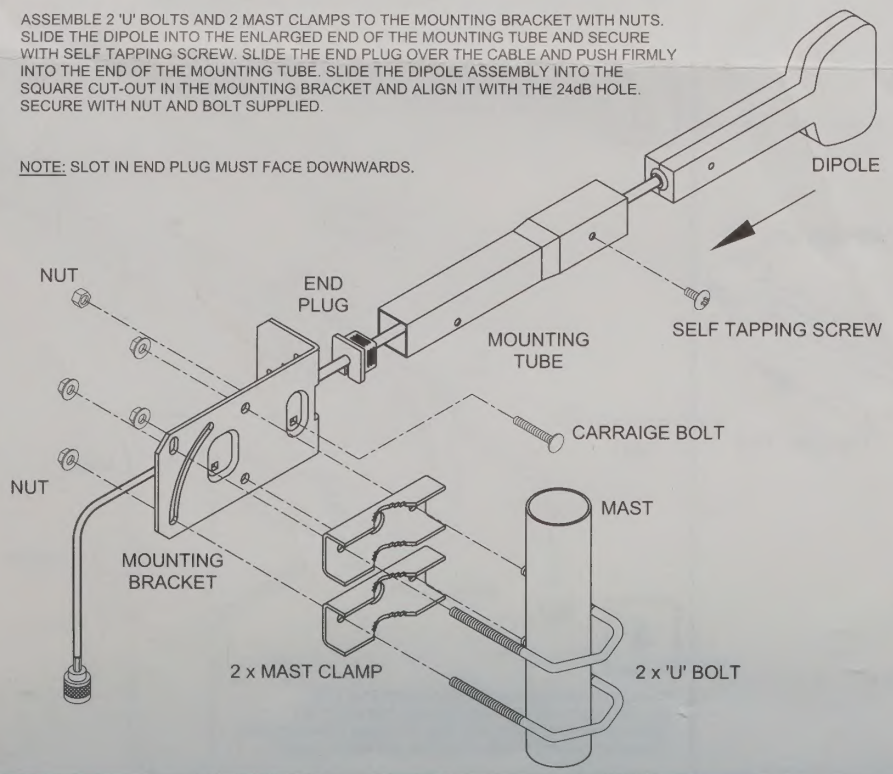

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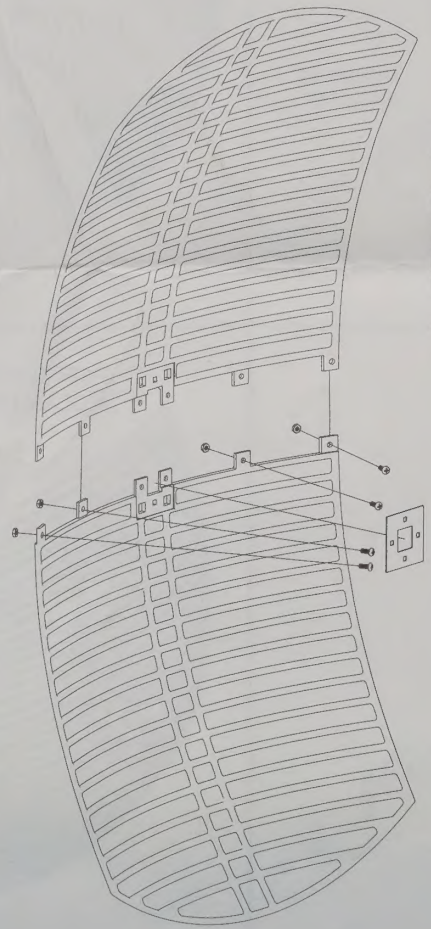

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Installation Instructions for Motorola, Toshiba, Mitsubishi and similar RF Power Transistors and Modules

Please read these installation notes for RF Power Transistors & Modules. We have found that most failures in RF components can be traced to improper installation or tune-up procedures.

Transistor & Module Mounting and Handling

(1) Before new part installation, clean all old thermal compound or contaminates from the heatsink. The surface should be smooth and clean, small burrs on mounting holes or bits of solder or metal will prevent proper heat transfer.

(2) Make sure there is adequate clearance between the components and the circuit board. Inadequate clearance may cause cover or substrate to crack or pop off transistor base.

(3) Check the component's heatsink for flatness. Although factory specs call for maximum 10 mils (.01") flatness, we believe that a significant lowering of component temperature may be achieved by "lapping" the heatsink. Our method uses a sheet of "600 grit wet or dry" sandpaper. Place over a flat surface such as a clipboard. Sand heatsink in a straight lengthwise motion. Remove all dust from the sanding.

(4) Spread a thin layer of fresh thermal joint compound on the new part. The compound provides heat conduction across otherwise small voids existing between the two surfaces. (An excessive amount of compound will actually reduce heat conductivity.) We recommend the compound "Thermalcote". (It is available from us and other electronics distributors.)

(5) Care should be taken to avoid dropping part onto a hard surface.

(6) Solder leads to the circuit board. Avoid excessive bending of leads.

(7) The recommended solvent for cleaning the residual flux is Ethyl Alcohol.

Module Installation Tips

(1) Inspect the transmitter circuit before turn-on. As an example, in some VHF/UHF transceivers we have found defective PIN antenna switching diodes (as high as 20%). This indicates that a defective antenna may have caused the antenna switching circuit to fail, thus damaging the module. We suggest checking each diode in the switching circuit for leakage and high-forward/low-reverse resistance. This is easily done by lifting one end of diode under test and connecting a conventional analog Ohmmeter (X10 scale). Look for the usual high-reverse/low-forward resistance readings.

(2) Check the power control circuit for proper operation. PIN Diode failure may be caused by a leaky or insufficiently turned-on driver transistor. If any doubt, replace.

(3) To avoid damage to the new component during tune-up phase, the bias circuit should be checked for proper operation and setting.

(4) Initial test should be at low power; if all appears normal, proceed to next step.

(5) Refer to your equipment manual for power adjustment. As the new module may have higher gain than the original, you should reduce the drive level before high power test.

(6) Most modules will exceed the specified power rating. It is suggested, however, not to exceed the module or equipment rating as reliability rapidly decreases with increasing power.

(7) Should the new module fail in the transmitter, it would be reasonable to assume there is a problem remaining which has not been found, i.e.: (a) Intermittent antenna or cable; (b) Intermittently defective PIN diode or associated control circuit, cold solder joint, etc.; (c) Power setting above rated transmitter output.

Transistor Tune-up Tips

Matched Transistors are available from RF Parts Company. Transistors are selected into sets based on various criteria, including selection for low I_{cbo} leakage, uniform power gain and linearity, similar d.c. Beta, and normal curve-tracer readings. The RF Power Test does not represent maximum power, only an output measurement for a selected drive level. Example: We test each MRF454 in a test fixture at 3 watts input drive. The corresponding output is measured. A typical test output of 80 watts is about 75% of the transistor's peak capability. Transistors are then grouped by Beta & Power Gain. Thus, we are able to supply matched pairs, sets of 4, 8, 16, 32, etc., with very similar characteristics. You should save the transistor envelope, as it gives test information on the parts inside. In the event you are required to replace a transistor at a later time, you can usually order a similar replacement from the test data.

(1) Transistor installation is essentially the same as RF Power Modules. Care should be taken not to over tighten transistors having "studs", i.e. MRF1946A/MRF454A/MRF455A, etc., as the screw is made of copper.

(2) Transistors & RF Power Modules can be damaged by one or combination of the following factors: Excessive case temperature, excessive voltage or current, excessive drive power, oscillations in the circuit, defective pin diode (and/or control circuit), excessive VSWR, etc.

(3) Some amplifiers are basically unstable and care should be taken to avoid excessive bias. Optimum bias in CLASS AB circuits is a collector current (at zero RF drive) less than 0.5% of the normal maximum collector current. Good linearity will be achieved without pushing the transistors into CLASS A (which often causes oscillation).

(4) The technician should first test at low power (low drive or low power setting on amplifier). You may increase drive power if the circuit remains stable and within normal current levels. When the power peak is reached, increased drive will not significantly increase output. At that point, output tuning should be adjusted to slightly less capacitance. Example, in a broadband amplifier, the tuning capacitor across the output winding should be set at slightly less capacitance than at peak power setting.

(5) MOS type parts require special care in regards to static electricity (similar to MOS IC's).

General Limited Warranty Information

NOTICE: Normally, no exchange or warranty on transistors/modules which, in our opinion, have been damaged, installed, or used. Therefore, be sure the parts are proper for your equipment. Modules & transistors are fully tested under load and SWR by the factory to meet their specifications. The factory will not guarantee parts once installed.

If you have technical questions regarding installation or operation of products sold by RF parts Co., please feel free to call our Technical Department between the hours of 10:00 a.m. and 4:00 p.m. Pacific Time. The telephone number to call is (760) 744-0750, or e-mail us at: rfp@rfparts.com *Technical personnel are <u>not</u> available on our "800" order line.*

READ THIS BEFORE INSTALLING TUBES

Upon receipt, inspect all tubes to determine any shipping damage. If damaged, save box and all packing material. Contact the delivery service (UPS, etc.) to make claim. RF Parts cannot initiate a claim for shipping damage, you must contact delivery service directly. Do not send tubes to RF Parts. Only the delivery company can take care of the return.

Transmitting Tubes

(a) New Eimac, Amperex, RFP (RF Parts Co.), Taylor, Svetlana and similar power grid transmitting tubes carry the Manufacturers Limited Warranty against defective material and workmanship.

(b) RF Parts Co. offers an extended limited warranty on its RFP PREMIUM 3-500ZG tubes: 2 year/1000 hours against manufacturing defects when used in amateur service (first year full exchange/second year prorated).

(c) Standard Svetlana tube warranty varies from 1 year to 3 years depending on the tube type. Discontinued and New Old Stock (NOS) tubes carry a 90 day Limited Warranty against defects in material and workmanship when used in Amateur Radio or ICAS services. Included are all Eimac, Amperex, and Cetron glass tubes. Contact us regarding limited warranty on a particular tube.

(d) Tube problems resulting from improper operation, i.e. *excessive* operating temperature or power levels will void Manufacturer's Limited Warranty. These conditions are the responsibility of the equipment operator.

(e) Tube Pin Heating or desoldering resulting from defective sockets (i.e. SB220) are not considered a warranty item. We recommend examination of original tubes for signs of this problem.

(f) If grounded grid equipment develops a tube short, inspection of the grid circuit should be made to locate possible open choke or resistor before installation of new tubes.

(NOS) New Old Stock tubes (older date codes) are certified to be in new condition and carry a 30-90 day limited warranty (depending on tube) against manufacturing defect.

Receiving & Special Purpose Tubes

(a) Before installation of new tubes, be sure the tubes supplied are the ***exact type required by your equipment.*** Some linear amplifiers need a particular brand or tube type in order to operate properly at full power.

(b) ***Once installed in equipment, tubes are considered used. Thus, cannot be returned for exchange.*** Damage to tubes from improper application cannot be covered by warranty.

(c) ***TV Sweep tubes*** (6JE6, 6KD6, 6KG6, 6KV6, 6LF6, 6LQ6, 6LX6, 6MJ6, 20LF6, 30KD6, 8950, 8975, EL509, EL519, M2057, etc.) are not designed rated, or warranted by manufacturer for use in RF linear amplifier service. Sweep tube Limited Warranty is 10 days except for breakage or when damaged by operation outside the tube manufacturer's specified settings. Therefore, care should be exercised to avoid premature failure. It is wise to operate sweep tubes at lower power to improve tube life. (As an example, 6JE6/6KD6/6KG6/6LF6/20LF6/8950, etc., should be limited to 65w carrier per tube. Use of modulators or peak enhancing methods will accelerate wear-out.) All sweep tubes are tested prior to shipment.

(d) Tubes used in amateur transceivers: 6146B, 6146W, 6JS6C, 6JB6, 12BY7 carry a 90-day limited warranty against factory defects.

(e) "Receiving Tubes" carry a 90 day limited warranty.

(f) New tubes returned to RF Parts which are accepted for *credit* are subject to a 15% restocking charge to cover tube testing and handling.

All receiving & special purpose tubes are factory tested to meet factory specifications. RF Parts Co. tests emission and performs visual inspection for breakage, loose caps, loss of vacuum, etc., prior to shipment. We suggest all tubes be ordered in matched sets in an effort to equalize power sharing and stable operation. Matched tubes are selected for best performance, matching of Gm, plate current, etc. All possible care is taken to supply tubes in good condition. No further claim or warranty on receiving & special purpose tubes is offered or implied.

Notes:

(a) When replacing Japanese 6JS6C tubes in FT-101 transceivers with U.S. brand, it is necessary to replace the 100 pF series feedback capacitor with a 10pF/1KV dipped mica cap or two 20 pF mica caps in series (equalling 10 pF/1KV) before neutralizing.
(Note: Total series feedback capacitance of 10-20 pF is acceptable.)

(b) Consult equipment Owners Manual for tune-up and operating instructions to avoid possible tube damage. Abuse of all tubes, including evidence of excessive dissipation, plate melting, heat caused discoloration of surface, breakage or cracks in glass, and loss of emission due to excessive wear, are excluded from any limited warranty.

How to Return Tubes

Tubes to be returned for inspection must be handled in the following manner:

(1) Call Customer Service Dept. at (760) 744-0750 for return tracking number.

(2) Original Purchase Receipt must be included with tubes. No exceptions! (No original purchase receipt=No warranty.)
Our Limited Warranty applies to original purchaser only.

(3) A completed failure report form should be returned with power grid (transmitting) tubes.

(4) Tubes should be returned by prepaid United Parcel Service. Pack tubes carefully to assure safe delivery. Insure if necessary. Warranty coverage is not possible if tubes are received broken. (An outside container must be used in addition to regular 3-500Z, 4-400A, etc. tube box.)

Allow 20 days at our plant for evaluation by our staff. *We will contact you with results of our inspection.* If it becomes necessary for us to forward tube to the manufacturer, please allow additional time for their evaluation. (Note: Eimac and Svetlana sometime require up to 6 weeks.) Any inquiries regarding warranty should be made directly to RF Parts Customer Service Department at (760) 744-0750, during the hours of 10 a.m.-4 p.m. Pacific Time (1 p.m.-7 p.m. Eastern Time). The Customer Service Dept. does not have an "800" number. You may also reach us by e-mail at: rfp@rfparts.com

MIDLAND LMR
LAND MOBILE RADIO

1690 NORTH TOPPING • KANSAS CITY • MISSOURI • 64120
(P.O. BOX 419903 • KANSAS CITY • MISSOURI • 64141)
TELEPHONE: (816) 241-8500 • FAX: (816) 245-1144

7/18/89

70-2187A SYN-TECH WIDEBAND OPTION KIT

The performance bandwidth (maximum spread of channel frequencies) of certain SYN-TECH transceivers can be improved by the 70-2187 option kit. This kit is an additional voltage regulator which, when wired into the transceiver as instructed below, sources both VCO steering voltage driver stages in the synthesizer with 10 Volts instead of 8 Volts. Performance bandwidth will be improved as follows:

Transceiver Model Number	RX Bandwidth		TX Bandwidth	
	Before	After	Before	After
70-050/052/055/056/058	1 MHz	2 MHz	1 MHz	2 MHz
70-060/066/076	2 MHz	3 MHz	2 MHz	8 MHz
70-340/380/385/440/480/485/840	4.5 MHz	6 MHz	4.5 MHz	7 MHz
70-530/565/630/665/930	5 MHz	8 MHz	10 MHz	15 MHz

INSTALLATION

1. Remove the top and bottom covers from the transceiver. Disconnect all plugs to the Synthesizer/Transmitter Board and remove its securing screws. Lift the PC board out of the transceiver.

2. Remove C127 and Q105 from the top side of the Synthesizer/ Transmitter Board.

3. Remove any solder from the three wire connect holes shown on the following Top View diagram.

   NOTE: The diagrams attached show a VHF TOP SIDE Synthesizer/Transmitter Board. The UHF TOP SIDE PC board patterns are different, but areas relevant to positions specified herein are exactly as shown.

   However Diagram #4 BOTTOM SIDE PC board view is for all models except UHF. And Diagram #5 is for UHF models.

4. Secure the Wideband Option Board in the position shown on the Top View diagram #1 with the adhesive foam pad.

5. Solder the brown (ground) as shown on the Top View diagram #1.

6. Note the different connection points of the RED (B+) depending on the model of radio. Connect the RED (B+) wire according to the diagrams.

   For a 70-050/055/058/060/066/076/340/440/840/530/630/930 see **Diagram 1**.

   For a 70-052/380/385/565 see **Diagram 2.**

   For a 70-056/480/485/665 see **Diagram 3**.

7. Remove R128 and R718 from the bottom side of the Synthesizer/Transmitter Board. Location shown in **Diagram 4** or **5**, depending on Model of radio.

8. Cut the plating runner leading to the feed-through hole as shown on the following Bottom View **Diagram 4** or **5**.

9. Using the hook-up wire provided, cut two jumper wires that are long enough for the following connections on the bottom side of the Transmitter Board. Connect one wire between Q106 collector and the feed-through hole isolated in the previous step. Connect the other wire between the R718-pad and the isolated feed-through hole. Do not solder the jumpers to the feed-through hole, yet.

10. Feed the orange wire from the Wideband Option Board through the feed-through hole from the top side of the Synthesizer/ Transmitter Board as shown on the Synthesizer/Transmitter Board Top View diagram. Then solder this wire, and the two jumper wires into the hole.

11. Reassemble the modified Synthesizer/Transmitter Board and connections into the transceiver.

12. Proceed with the Alignment Procedures exactly as described in the transceiver service manual except for the following changes:

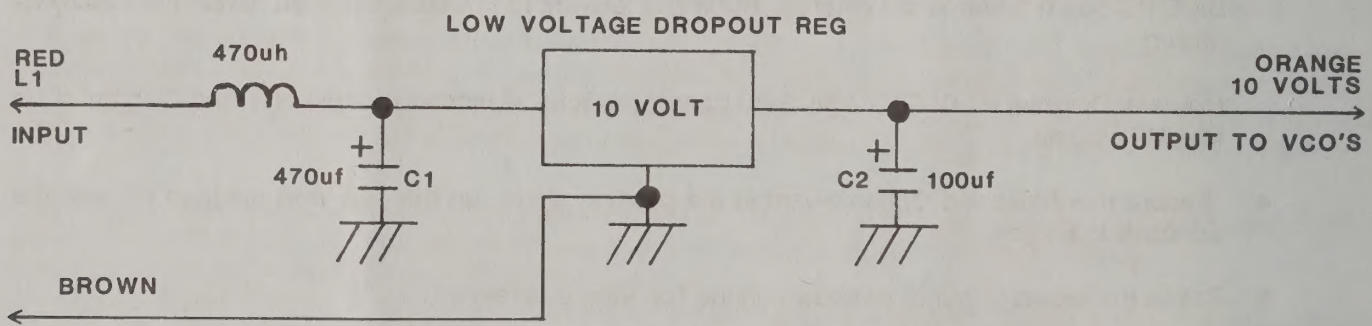
    a. In the Main VCO Alignment step; adjust for 7.50 Volts DC on TP701 instead of 4.50 Volts.

    b. In the Transmit VCO Alignment step; adjust for 7.50 Volts DC on TP101 instead of 4.50 Volts.

13. Reassemble the transceiver covers.

70-2187A Kit Parts List

Description	Quantity	Part Number
Wideband Option PC Board Assembly	1	70-075334
30 AWG Hook-up Wire, 250 mm	1	70-034250
Adhesive Foam Pad, 20 mm x 20 mm	1	70-157092



Wideband Option Board Schematic

TRANSMITTER PC BOARD (TOP VIEW)

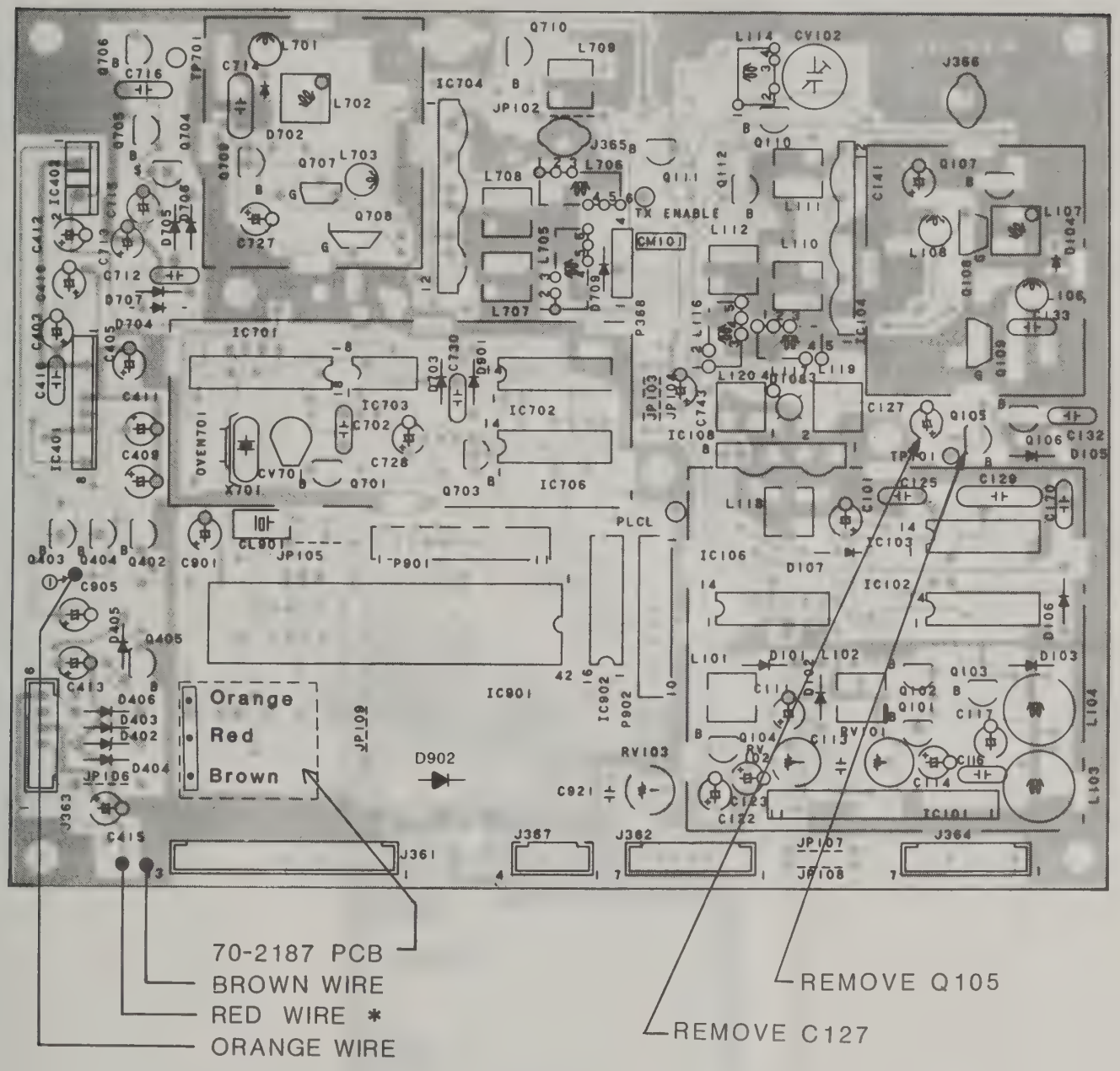
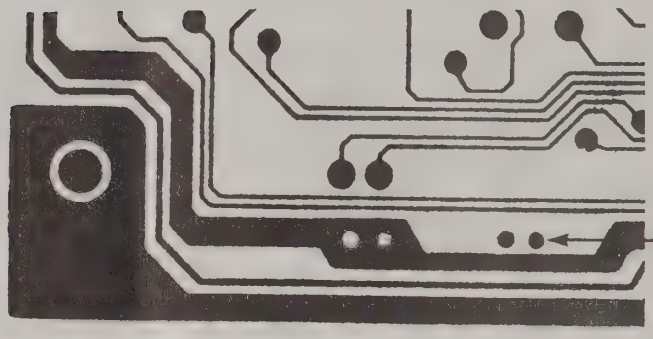


DIAGRAM #1

* This RED connection for low power models only

RECEIVER PC BOARD (TOP VIEW)



RX-154-1 TOP VIEW

DIAGRAM #2

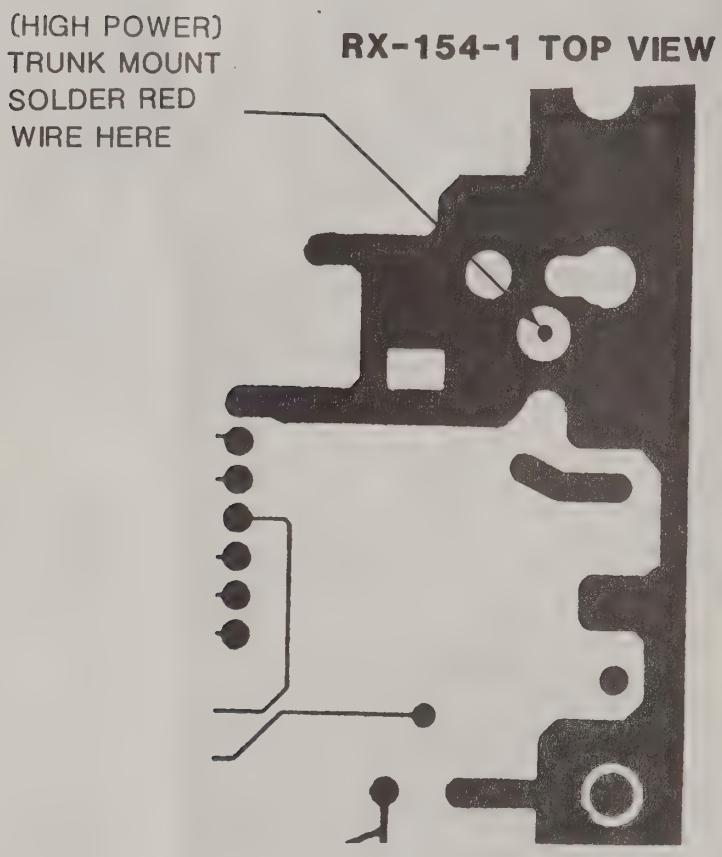


DIAGRAM #3

ALL MODELS EXCEPT UHF TRANSMITTER PC BOARD (BOTTOM VIEW)

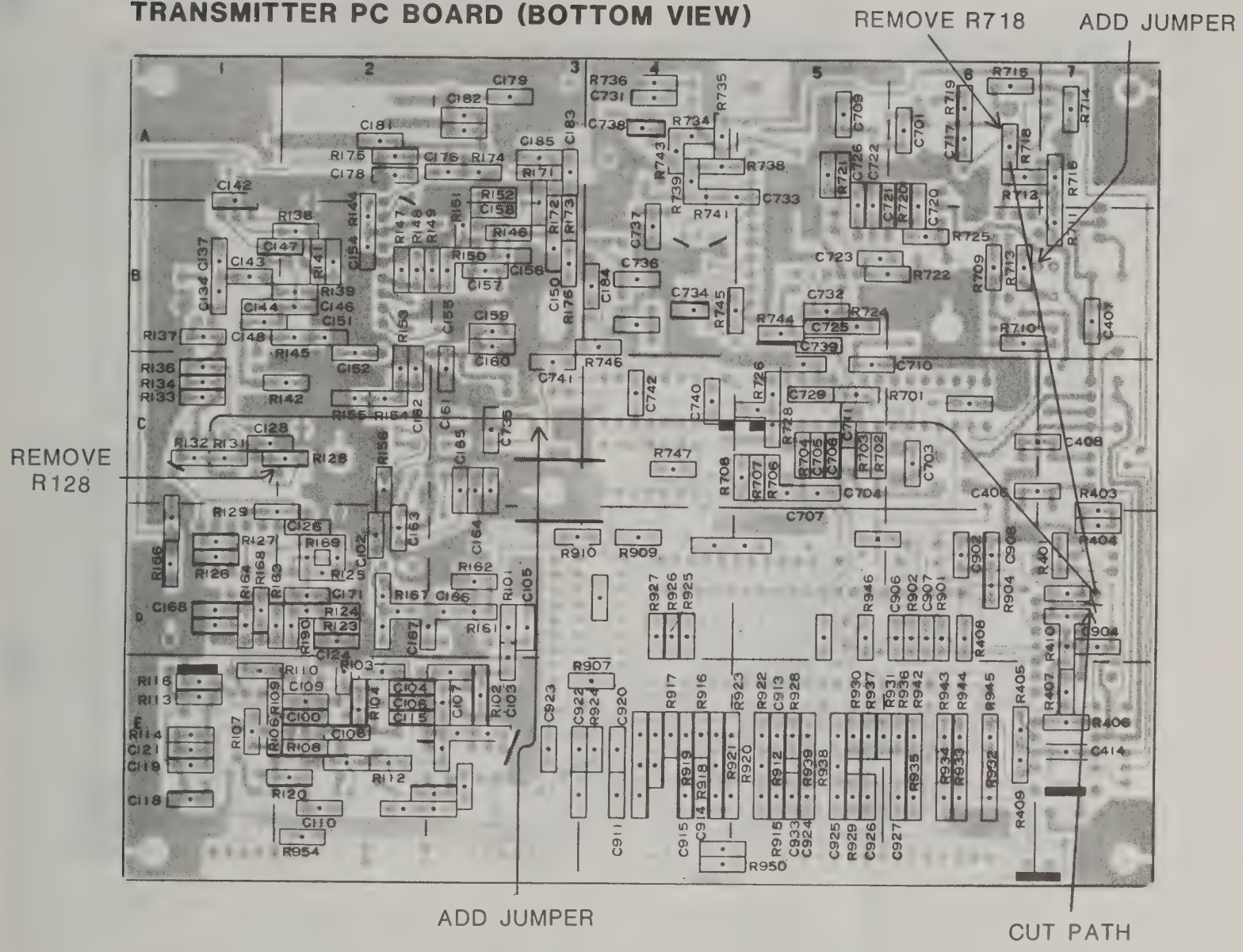
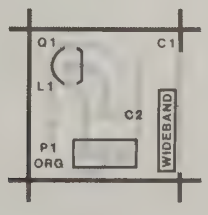


DIAGRAM #4



70-2187A PC BOARD

UHF
TRANSMITTER PC BOARD (BOTTOM VIEW)

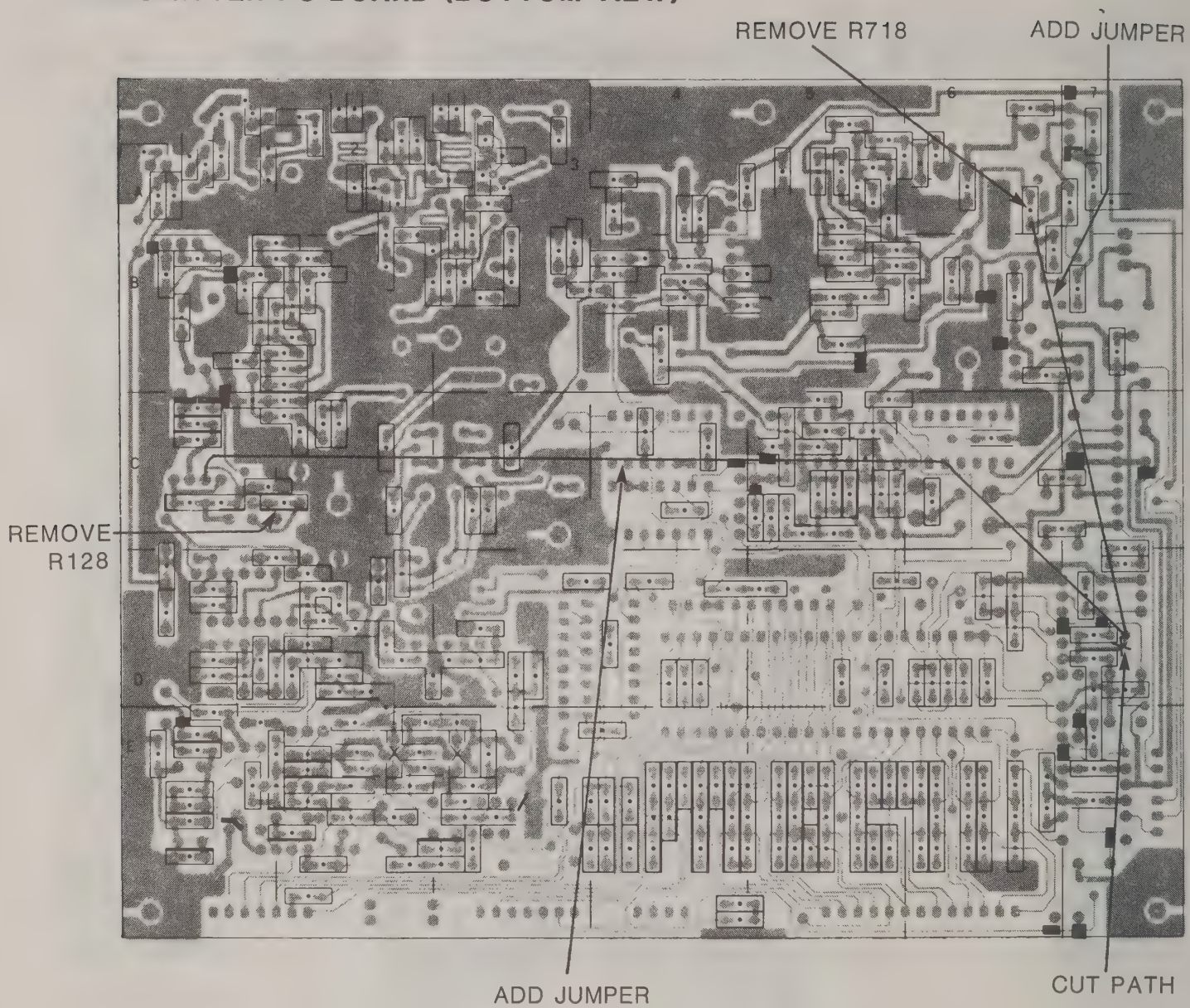


DIAGRAM #5

FOREWORD

1. SCOPE OF MANUAL

This manual is intended for use by technicians experienced with similar types of equipment. It contains all the service information required for the equipment described and is current as of the printing date. Changes which occur after the printing date are incorporated by Instruction Manual Revisions (SMR). These SMR's are added to the manuals as engineering changes are incorporated into the equipment.

2. MODEL AND KIT IDENTIFICATION

Motorola equipments are specifically identified by an overall model number on the nameplate. In most cases, assemblies and kits which make up the equipment also have kit model numbers stamped on them. When a production or engineering change is incorporated, the applicable schematic diagrams are updated.

3. SERVICE

The Motorola Test Equipment Service Center is charged with the service responsibility for all test equipment supplied by the Motorola Communications Sector. The center maintains a stock of original equipment replacement parts and a complete library of service information for all Motorola test equipment.

Most in-warranty repairs are performed at the center. Exceptions include repairs on some equipment not manufactured by Motorola which are performed by the original supplier under the direction of the Motorola Test Equipment Service Center. Out-of-warranty service is performed on a time and materials basis at competitive rates. Customer satisfaction is continually surveyed by reply cards returned with repaired instruments.

The Motorola Test Equipment Service Center also provides a convenient telephone troubleshooting service. Frequently, a user technician can troubleshoot a piece of equipment and isolate the defective components under the direction of the Motorola Test Equipment Service Center via telephone. Required replacement parts are then immediately shipped to the user thereby reducing shipping time and servicing costs. For telephone troubleshooting, contact the Motorola Test Equipment Service Center toll free at 1-800-323-6967.

All other inquires and requests for test equipment calibration and repairs should be directed to the Motorola Area Parts Office. They will contact the Motorola Test Equipment Service Center, process the necessary paperwork and, if necessary, have the Center contact you to expedite the repair.

4. REPLACEMENT PARTS ORDERING

Motorola maintains a number of parts offices strategically located throughout the United States. These facilities are staffed to process parts orders, identify part numbers, and otherwise assist in the maintenance and repair of Motorola Communications products.

Orders for all replacement parts should be sent to the nearest area parts and service center listed below. When ordering replacement parts, the complete identification number located on the equipment should be included.

5. ADDRESSES

5.1 GENERAL OFFICES

MOTOROLA Communications and Electronics Inc.
Communications & Electronics Parts
1313 E. Algonquin Rd.,
Schaumburg, Illinois 60196
Phone: 1-312-576-3900

5.2 U.S. ORDERS

WESTERN AREA PARTS
1170 Chess Drive, Foster City
San Mateo, California 94404
Phone: 1-415-349-8621
TWX: 910-375-3877

MIDWEST AREA PARTS
1313 E. Algonquin Rd
Schaumburg, Ill. 60196
Phone: 1-312-576-7430
TWX: 910-693-0869

MID-ATLANTIC AREA PARTS
7230 Parkway Drive
Hanover, Maryland 20176
Phone: 1-301-796-8763
TWX: 710-862-1941

EAST CENTRAL AREA PARTS
12995 Snow Road
Parma, Ohio 44130
Phone: 1-216-433-1560
TWX: 810-421-8845

EASTERN AREA PARTS
85 Harristown Road
Glenrock, New Jersey 07452
Phone: 1-201-670-9673
TWX: 710-988-5614

ROCKY MOUNTAIN AREA PARTS
20 Inverness Place East
Engelwood, Colorado 80112
Phone: 1-303-790-2323
TWX: 910-935-0785

PACIFIC SOUTHWESTERN AREA PARTS
9980 Carroll Canyon Road
San Diego, California 92131
Phone: 1-619-578-8030
TWX: 910-335-1516

GULF STATES AREA PARTS
1140 Cypress Station
Houston, Texas 77090
Phone: 1-713-537-3636
TWX: 910-881-6392

SOUTHWESTERN AREA PARTS
3320 Belt Line Road
Dallas, Texas 75234
Phone: 1-214-888-6777
TWX: 910-860-5505

SOUTHEASTERN AREA PARTS
5096 Panola Industrial Blvd.
Decatur, Georgia 30032
Phone: 1-404-987-2232
TWX: 810-766-0876

5.3 CANADIAN ORDERS

MOTOROLA LTD.
National Parts Department
3125 Steeles Avenue East
Willowdale, Ontario M2H 2H6
Phone: 416-499-1441
TWX: 610-491-1032
Telex: 06-526258

5.4 ALL COUNTRIES EXCEPT U.S. AND CANADA

MOTOROLA, INC.
International Parts Dept.
1313 E. Algonquin Road
Schaumburg, Illinois 60196 U.S.A.
Phone: 1-312-576-6482
TWX: 910-693-0869
Telex: 722443
Cable: MOTOL PARTS

MOTOROLA TEST EQUIPMENT PRODUCTS
AUTHORIZED WARRANTY SERVICE CENTERS

Motorola C & E Parts
Test Equipment Service Center
1308 N. Plum Grove Road
Schaumburg, IL 60173
1-800-323-6967
1-312-576-7025 (Illinois Only)
MAMS: NAGOU
TTY: 910-693-0869

Motorola Service Center West
West Coast Test Equipment
Service Center
2333 B Utah
El Segundo, California 90245
Phone: (213) 536-0784

Motorola C & E, Inc.
Hawaii Service Center
99-1180 Iwaena Street
Aiea, HI 96701
1-808-487-0033
TTY: 63212

Motorola Australia Pty. Ltd.
Test Equipment Service Center
666 Wellington Road
Mulgrave, VIC 3170
Melbourne, Australia
Phone: 3-561-3555
Telex: 32516 MOTOCOMA AA
Cable: MOTOCOM MELBOURNE
MAMS: FEMEL

Motorola GmbH
F and V ABT. Frachtzentrum FZF
6000 Frankfurt Main/Flughafen
West Germany
Attn: METEC
Phone: (0) 6128-702130
Telex: (0) 4182761 MOT D

Motorola France S.A.
Test Equipment Service Center
14, Allee de Cantal CE 1455
91020 Evry Cedex, France
Phone: (6) 077.790.25
Telex: .60043F MOTEV
MAMS: FAFEV

Motorola Canada, LTD.
Test Equipment Service Center
3420 Pharmacy Avenue
Unit 11
Scarborough, Ontario M1W 2P7
Phone: (416) 499-1441
TTY: 610-491-1032
MAMS: NAWIL

Motorola South Africa (Pty.) Ltd.
Motorola House
5th Street
P.O. Box 39586
Wynberg, South Africa
Phone: 011-786-6165
Telex: 422-070 SA
CABLE: MOTOROLA JOHANNESBURG
MAMS: FESAF

MOTOROLA INC.
Communications
Sector

PORTABLE RADIO TEST SET
MODEL RTX-4005B

1. DESCRIPTION

The RTX-4005B Portable Radio Test Set is a service aid for the following Motorola *Handie-Talkie* series portable FM two way radios: *MT500, MX-300, HT90, HT440, HT600, PT500,* and *EXPO;* also, the test set may be used to service the *Maxar 50* fm two-way mobile radio. Typical measurements such as simulation of transmitter modulation and keying, receive audio output, and various receiver test points can be readily accessed. The applications and procedures using the test set are described within the appropriate radio service manual. Since the RTX-4005B Portable Radio Test Set is a self-contained unit, all interfacing to a portable or mobile radio is accomplished through an accessory cable, as described in paragraph 3.

2. OPERATOR ITEMS

All operator items are mounted on the front panel and are identified as to their function. Before using the RTX-4005B Portable Radio Test Set, the operator should thoroughly understand the functions of these items given in the following paragraphs. For quick reference, Figure 1 shows a brief functional description and location of all the operator controls.

- *MT B+ Binding Posts*

  15 V dc input power connections for *MT500* series radios when tested with the front panel cover removed. An inline fuse protects the B+ circuit. The black binding post is internally connected to the radio via the accessory cable.

- *AC/DC MTR Binding Posts*

  Connections for external ac or dc voltmeter when measuring circuit performance or the microphone (MIC) input level. The black binding post is internally connected to the radio via the accessory cable.

- *AUDIO IN Binding Posts*

  Connections for an external audio oscillator for circuit testing. The input impedance is 600 ohms and is developed from a 15 dB resistive network. The black binding post is internally connected to the radio via the accessory cable.

- *METER SELECTOR Switch*

  Determines which circuit is connected to the AC/DC MTR binding posts for performance measurements. The MIC (microphone) position provides metering of the internal radio microphone output level, or the input signal level from the audio oscillator connected to the AUDIO IN binding posts. The VOLUME position provides metering of the receiver audio directly from the volume control before it is fed to the output power amplification stages. The MX DISC position provides metering of the recovered receiver audio directly from the discriminator for *MX-300* series radios. The AUDIO PA position provides metering of the amplifier receiver audio.

- *MT PL Switch*

  Used to select the type of receiver squelch control, either *Private-Line* (PL) or noise (carrier), of *MT500* series radios. The ON position enables the PL squelch circuit while the OFF position disables the PL squelch circuit, reverting back to noise squelch control.

- *AUDIO OUT Switches*

  Used to route the recovered receiver audio to the test set speaker (SPKR) for audible testing or to the internal resistive LOAD for non-audible testing. Use the MT/MX/A/B/C rotary switch to select the proper LOAD impedance; MT position for *MT500* series radios and MX position for *MX-300* series radios, and "B" position for *HT600.*

technical writing services
1301 E. Algonquin Road, Schaumburg, IL 60196

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- *PTT Switch*

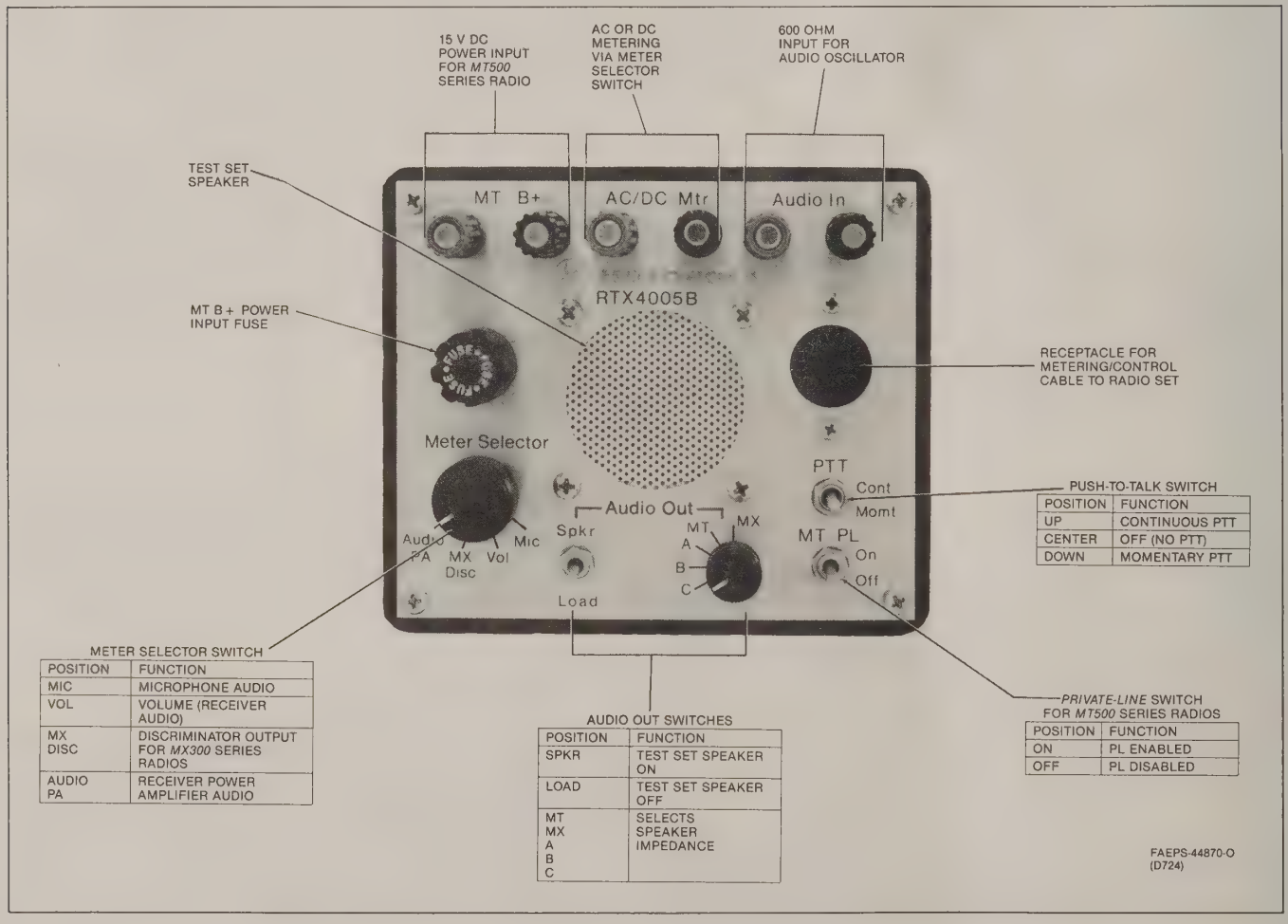
  Provides a switched ground push-to-talk (PTT) function to turn on the transmitter of the radio under test. This is a three-position switch with one non-locking, spring-loaded return-to-center position. The CONT (up) position is locking and provides a continuous PTT function whereas the MOMT (down) position is non-locking and provides the PTT function for as long as the switch is held in the MOMT position. The PTT function is disabled when the switch is in the unmarked (center) position.

3. ACCESSORY CABLES

There are several accessory cables available for servicing with or without the front cover panels installed as identified in Figure 2. The RTK-4000A and RTK-4021A Test Cables provide direct connection to the Universal *MT500* series radios and *MX-300* series radios, respectively, without removing the front cover from the radio. This permits rapid performance testing of the selected functions. The RTK-4001A Test Cable provides connection to *MT500* Series models, when the front cover is removed. This permits circuit adjustments to be made within the radio when the radio is being tested with the test set. The RTK-4003A RF Test Cable is available for making rf measurements of Universal *MT500* series radios without removing the front cover. The test set is not used when taking rf measurements with this cable.

The RTK-4013B Test Cable provides interfacing between the test set and *PT500* series radios by connecting directly to the microphone connector on the radio. The RTK-4038A Test Cable provides the interface between the test set and the *HT90* and *HT440* series radios only if the front cover is removed from the radio. The RTK-4039A Test Cable provides interfacing between the test set and the *HT90* and *HT440* series radios with or without the radio covers in place. The RTK-4059A Test Cable provides the interface between the test set to the *EXPO* series radios only if the radio unit is removed from the housing. The RTK-4073A Test Cable provides interfacing between the test set and the *Maxar 50* series radios by connecting directly to the microphone connector on the radio.

The RTK-4205A Test Cable provides interfacing between the test set and the *HT600* series radios.



PUSH-TO-TALK SWITCH

POSITION	FUNCTION
UP	CONTINUOUS PTT
CENTER	OFF (NO PTT)
DOWN	MOMENTARY PTT

METER SELECTOR SWITCH

POSITION	FUNCTION
MIC	MICROPHONE AUDIO
VOL	VOLUME (RECEIVER AUDIO)
MX DISC	DISCRIMINATOR OUTPUT FOR *MX300* SERIES RADIOS
AUDIO PA	RECEIVER POWER AMPLIFIER AUDIO

AUDIO OUT SWITCHES

POSITION	FUNCTION
SPKR	TEST SET SPEAKER ON
LOAD	TEST SET SPEAKER OFF
MT MX A B C	SELECTS SPEAKER IMPEDANCE

PRIVATE-LINE SWITCH FOR *MT500* SERIES RADIOS

POSITION	FUNCTION
ON	PL ENABLED
OFF	PL DISABLED

Figure 1. Portable Radio Test Set Operator Items

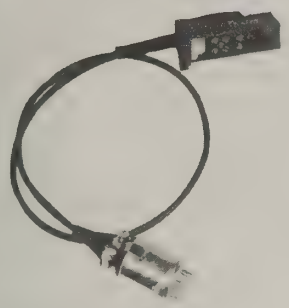
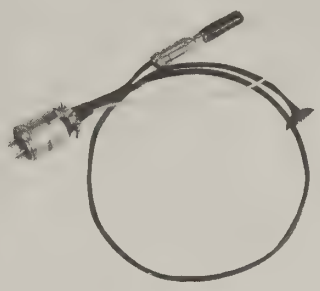
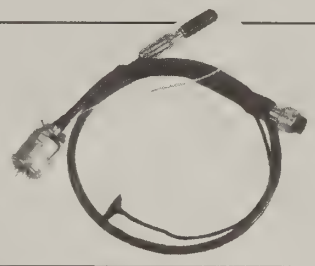
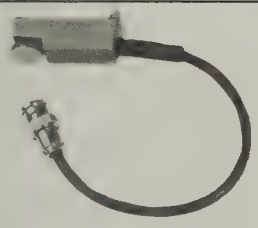
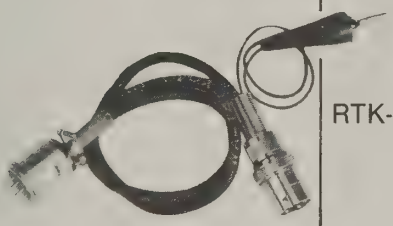
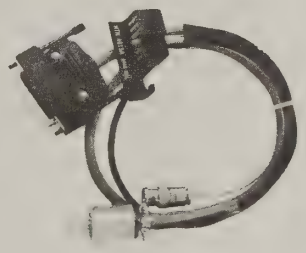
CABLE	PART NO.	USED WITH	CABLE	PART NO.	USED WITH
	RTK-4000A	UNIVERSAL *MT500* SERIES		RTK-4038B	*HT90* AND *HT440* SERIES
	RTK-4001A	BASIC OR UNIVERSAL *MT500* SERIES		RTK-4039B	*HT90* AND *HT440* SERIES
	RTK-4003A	*MT500* SERIES		RTK-4059A	*EXPO* SERIES
	RTK-4013B	*PT 500* SERIES		RTK-4073A	*MAXAR 50* SERIES
	RTK-4021A	*MX300* SERIES		RTK-4205A	*HT600* SERIES

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Figure 2. Accessory Cables For Portable Radio Test Set

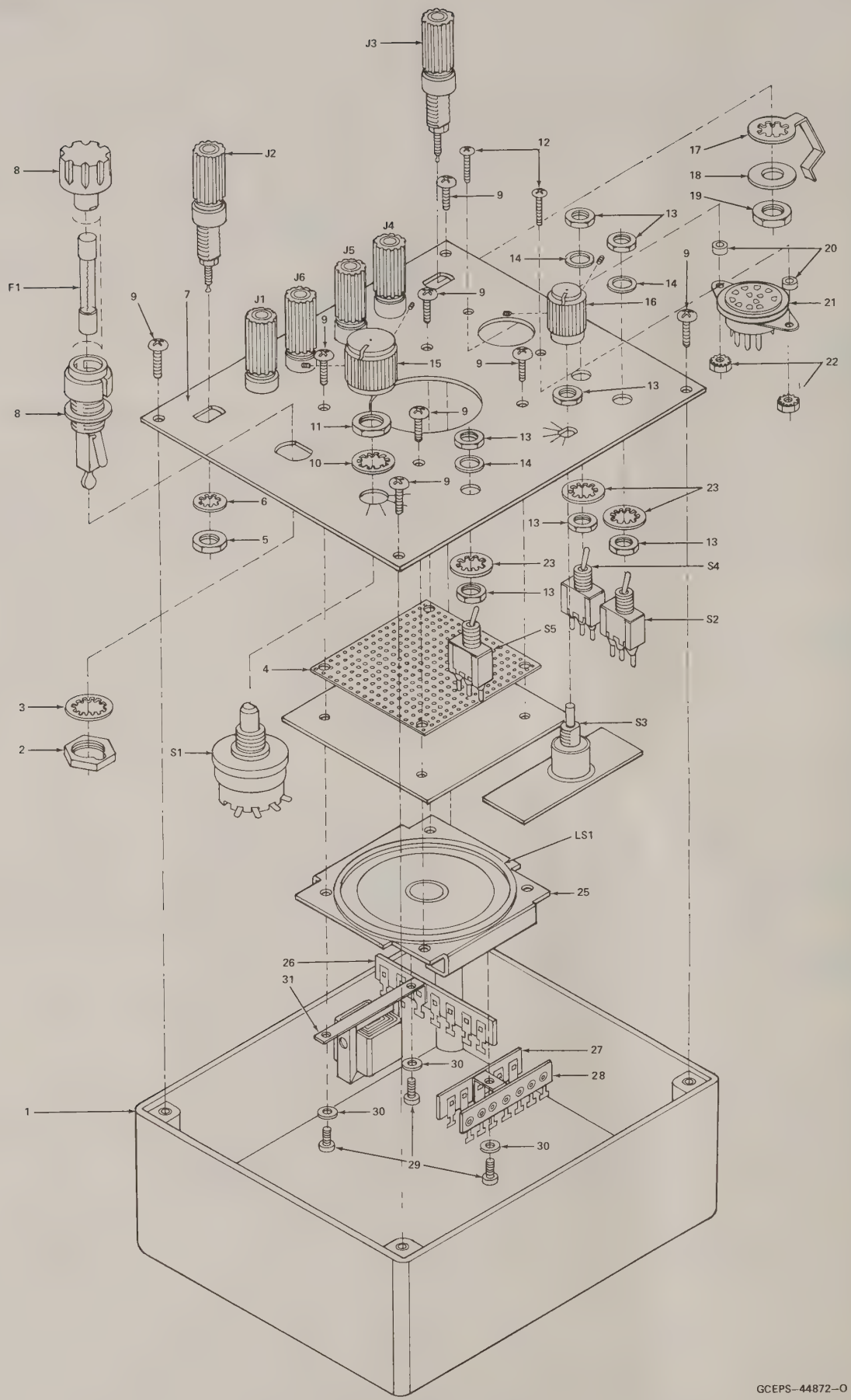


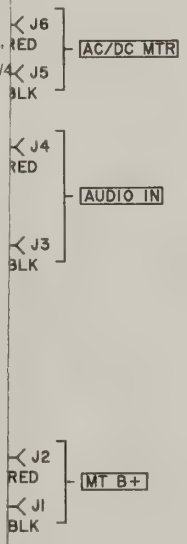
Figure 3. Mechanical Parts Detail

parts list

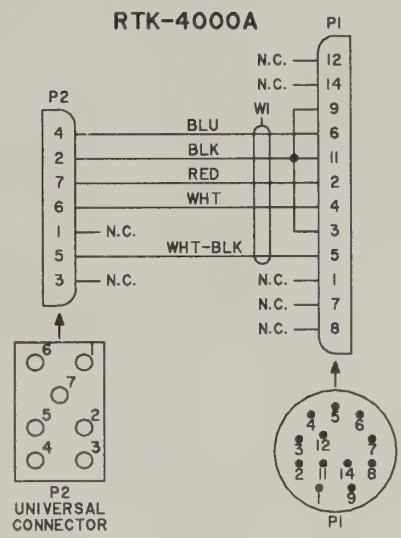
RTX4005B Portable Test Set PL-1070

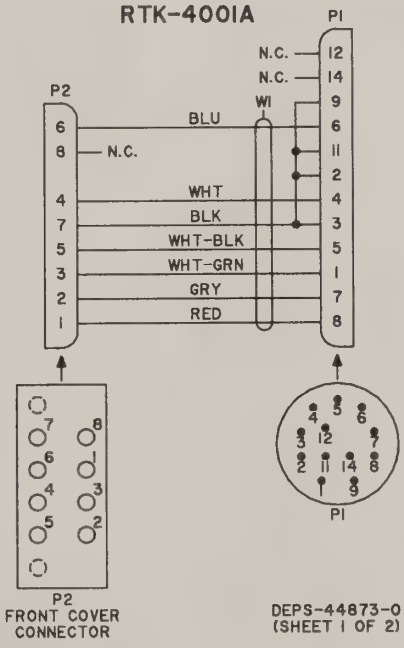
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		diode: (see note)
CR1	4882466H13	silicon
		fuse:
F1	6500042092	2amp, 250V
		connector:
J1,3,5	4600863924	post, binding: black
J2,4,6	4600863925	post, binding: red
J7	0982201E01	female, 12 contact
		speaker:
LS1	5005334D01	39 ohm
		resistor, fixed: ±5% 1/4W: unless otherwise stated
R1	0600125C21	68 ±10% 1/2W
R2	0600124A73	10k
R3	0600126A15	39 1W
R4,5	0600124C43	560 10%
R6	0600124A19	56
R7	0610621A75	59 ±1%
R8	0684444A04	7.87 ±1%
R9	0611009A17	47
		switch:
S1	4083624D01	rotary, 1 pole 4 position
S2	4080310A28	toggle,
S3	4080369B22	rotary, 1 pole 5 position
S4,5	4082085J02	toggle
		transformer:
T1	2584903H01	audio
		non-referenced items
	7584201D42	BUMPER
	4300854337	BUSHING, spacer
	1380329A66	SCREEN, speaker
	1584819F01	CASE
	2900005237	LUG, soldering
	3100120582	TERMINAL, 6 insulated #4 ground 1/4"
	3100124448	TERMINAL, strip 4 insulated #3 gnd 1/4
	3183193F01	TERMINAL, board
	3580313A21	GRILLE, felt
	3680337A83	KNOB
	3680337A85	KNOB: blk
	3380348A05	NAMEPLATE
	5483042H67	LABEL
	0200007018	NUT, 3/8-32x1/2x3/32"
	0200131435	NUT, 4-40x1/4x3/32"; 2 used
	0200140458	NUT, hex: 1/4-28x5/16x1/16"
	0300001911	SCREW, machine: 2-56x1/4"; 3 used
	0300121103	SCREW, machine: 6-32x3/8"; 8 used
	0300122924	SCREW, machine: 4-40x5/16" ; 2used
	0400001754	WASHER, flat: .328 .625 .040"
	0400007669	WASHER, lock: #6 split; 8 used
	0400007670	WASHER, lock: 1/4" internal; 3 used
	0400007698	WASHER, lock: 3/8" internal
	0400008242	WASHER, flat: .094 .250 .027"; 3 used
	0400008406	WASHER, lock: #2 internal; 3 used
	0400009788	WASHER, lock: 5/16" internal; 5 used
	0400115021	WASHER, lock: 1/4" internal
	0482650D02	WASHER, flat; 3 used
	0780329A67	BRACKET, speaker
	0982083C01	RECEPTACLE, fuse
	5483042H67	LABEL
	6480368B97	PANEL, front

note: For optimum performance, diodes, transistors, and integrated circuits n be ordered by Motorola part numbers.



METERING/CONTROL CABLES





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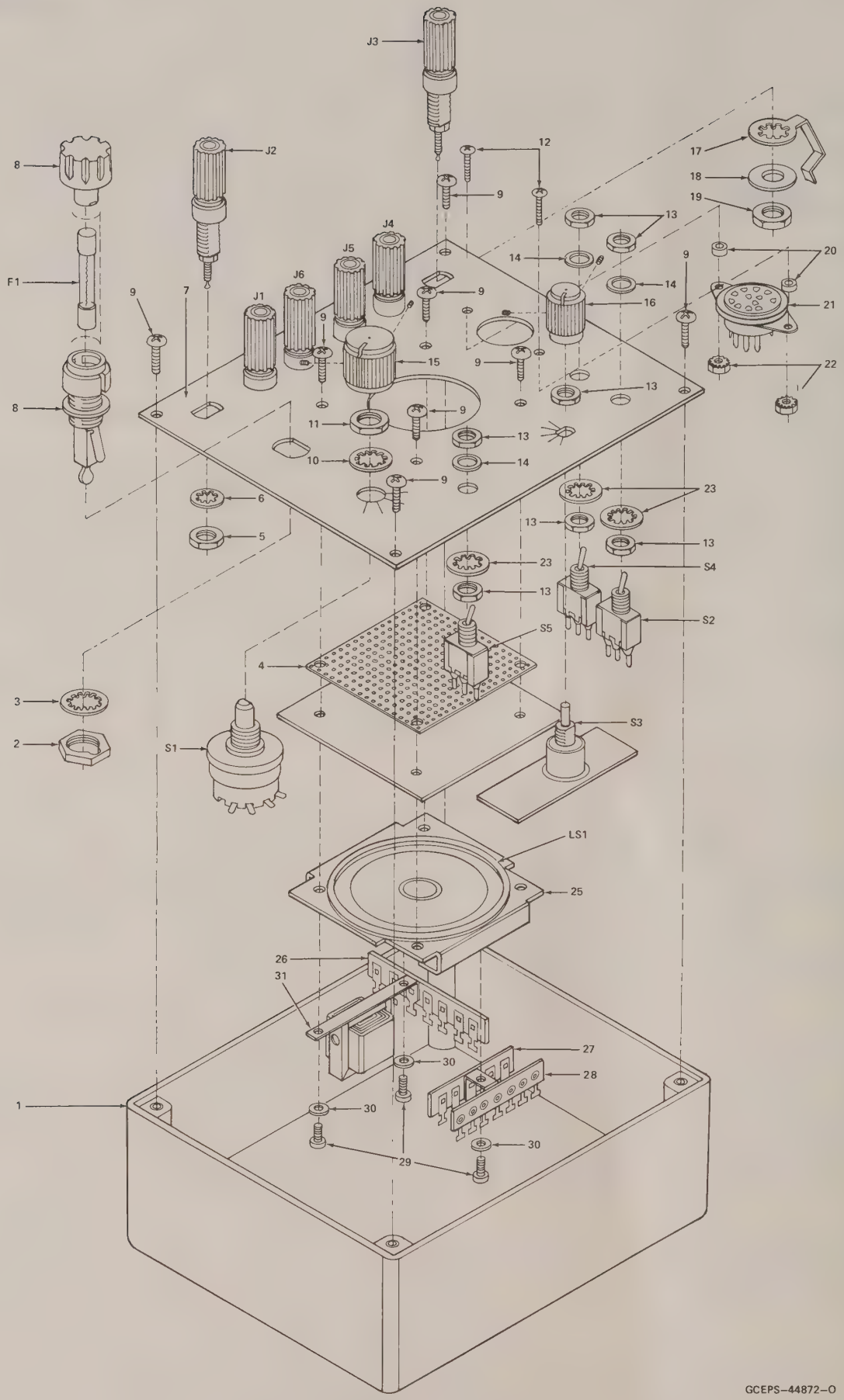


Figure 3. Mechanical Parts Detail

parts list

RTX4005B Portable Test Set — PL-10701-O

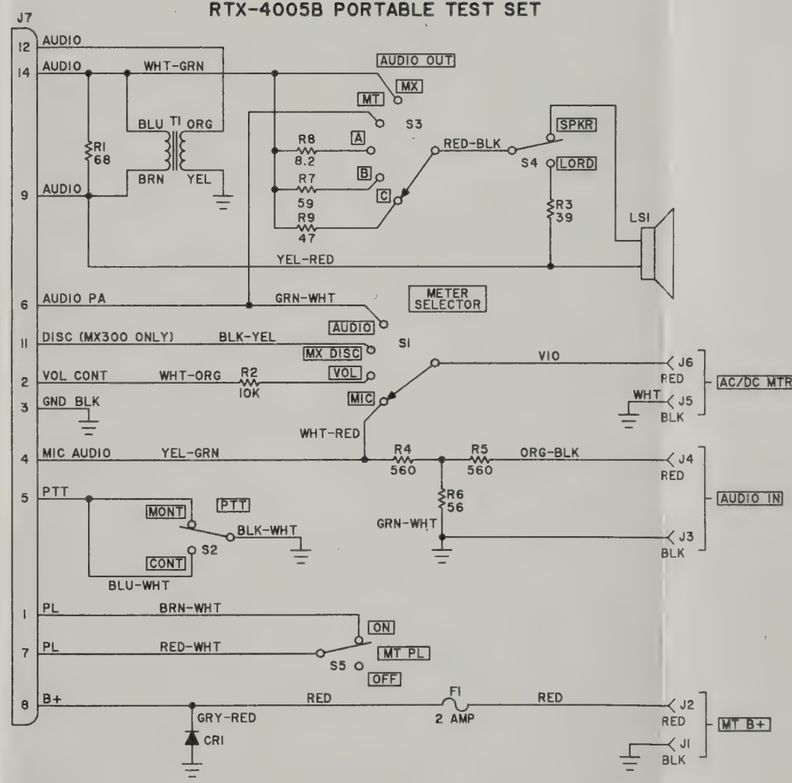
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		diode: (see note)
CR1	4882466H13	silicon
		fuse:
F1	6500042092	2amp, 250V
		connector:
J1,3,5	4600863924	post, binding: black
J2,4,6	4600863925	post, binding: red
J7	0982201E01	female, 12 contact
		speaker:
LS1	5005334D01	39 ohm
		resistor, fixed: ±5% 1/4W: unless otherwise stated
R1	0600125C21	68 ±10% 1/2W
R2	0600124A73	10k
R3	0600126A15	39 1W
R4,5	0600124C43	560 10%
R6	0600124A19	56
R7	0610621A75	59 ±1%
R8	0684444A04	7.87 ±1%
R9	0611009A17	47
		switch:
S1	4083624D01	rotary, 1 pole 4 position
S2	4080310A28	toggle,
S3	4080369B22	rotary, 1 pole 5 position
S4,5	4082085J02	toggle
		transformer:
T1	2584903H01	audio
		non-referenced items
	7584201D42	BUMPER
	4300854337	BUSHING, spacer
	1380329A66	SCREEN, speaker
	1584819F01	CASE
	2900005237	LUG, soldering
	3100120582	TERMINAL, 6 insulated #4 ground 1/4"
	3100124448	TERMINAL, strip 4 insulated #3 gnd 1/4"
	3183193F01	TERMINAL, board
	3580313A21	GRILLE, felt
	3680337A83	KNOB
	3680337A85	KNOB: blk
	3380348A05	NAMEPLATE
	5483042H67	LABEL
	0200007018	NUT, 3/8-32x1/2x3/32"
	0200131435	NUT, 4-40x1/4x3/32"; 2 used
	0200140458	NUT, hex: 1/4-28x5/16x1/16"
	0300001911	SCREW, machine: 2-56x1/4"; 3 used
	0300121103	SCREW, machine: 6-32x3/8"; 8 used
	0300122924	SCREW, machine: 4-40x5/16" ; 2used
	0400001754	WASHER, flat: .328 .625 .040"
	0400007669	WASHER, lock: #6 split; 8 used
	0400007670	WASHER, lock: 1/4" internal; 3 used
	0400007698	WASHER, lock: 3/8" internal
	0400008242	WASHER, flat: .094 .250 .027"; 3 used
	0400008406	WASHER, lock: #2 internal; 3 used
	0400009788	WASHER, lock: 5/16" internal; 5 used
	0400115021	WASHER, lock: 1/4" internal
	0482650D02	WASHER, flat; 3 used
	0780329A67	BRACKET, speaker
	0982083C01	RECEPTACLE, fuse
	5483042H67	LABEL
	6480368B97	PANEL, front

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

RTX4005B Mechanical Parts (Exploded View) — PL-10751-O

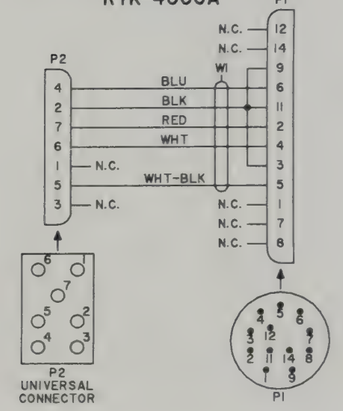
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
1	15-84819F01	CASE
2	2-7018	NUT, 3/8-32 × 1/2" × 3/32"
3	4-7698	WASHER, lock; 3/8" internal
4	13-80329A66	SCREEN, speaker
5	p/o J2	NUT
6	4-9788	WASHER, lock: 5/16" internal; 5 used
7	64-80368B97	PANEL, front
8	9-82083C01	HOLDER, fuse
9	3-121103	SCREW, machine: 6-32 × 3/8"; 8 used
10	4-115021	WASHER, lock: 1/4" internal
11	p/o S1	NUT
12	3-122924	SCREW, machine: 4-40 × 5/16"; 2 used
13	p/o S2, S4, S5	NUT, mounting: .062 × .312"; 6 used
14	p/o S2, S4, S5	WASHER
15	36-80337A85	KNOB (BLK)
16	36-80337A83	KNOB
17	29-5237	LUG, soldering
18	4-1754	WASHER, flat
19	2-140458	NUT, hex 1/4-28 × 5/16 × 1/16"
20	43-854337	BUSHING, spacer; 2 used
21	9-82201E01	
22	2-131435	NUT, 4-40 × 1/4 × 3/32"; 2 used
23	4-8406	WASHER, lock: #2 internal; 3 used
24	—	NUT USED
25	7-80329A67	BRACKET, speaker
26	31-83193F01	TERMINAL, board; 6 insulated #3 ground
27	31-124448	TERMINAL, strip; 4 insulated #3 ground
28	31-120582	TERMINAL, strip; 6 insulated #4 ground
29	3-1911	SCREW, machine: 2-56 × 1/4"; 3 used
30	4-8242	WASHER, flat: .094 × .250 × .027"; 3 used
31	7-80329A67	BRACKET, speaker

RTX-4005B PORTABLE TEST SET

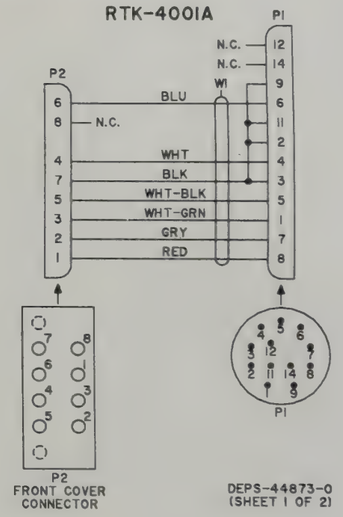


METERING/CONTROL CABLES

RTK-4000A



RTK-4001A



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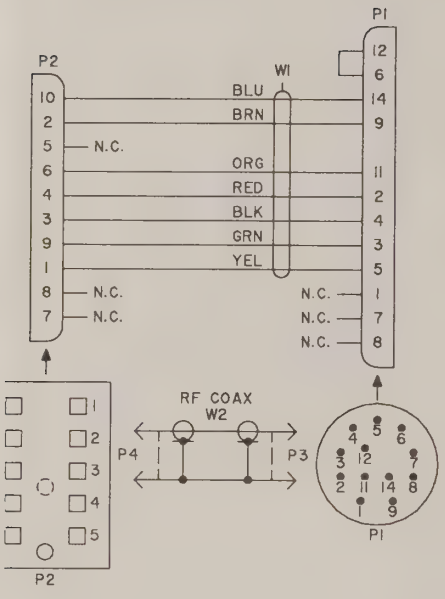
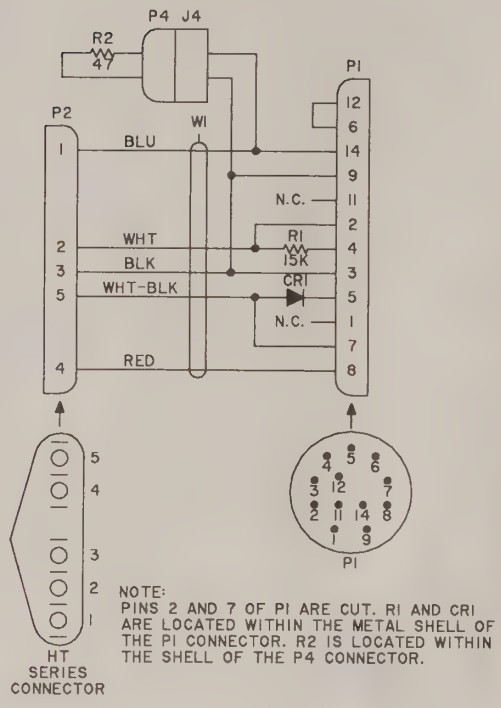
CABLES

RTK-4021A

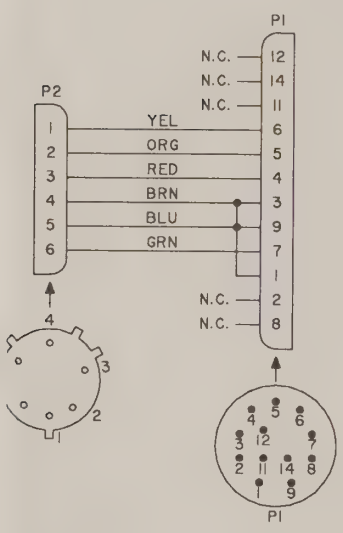


RTK-4038B

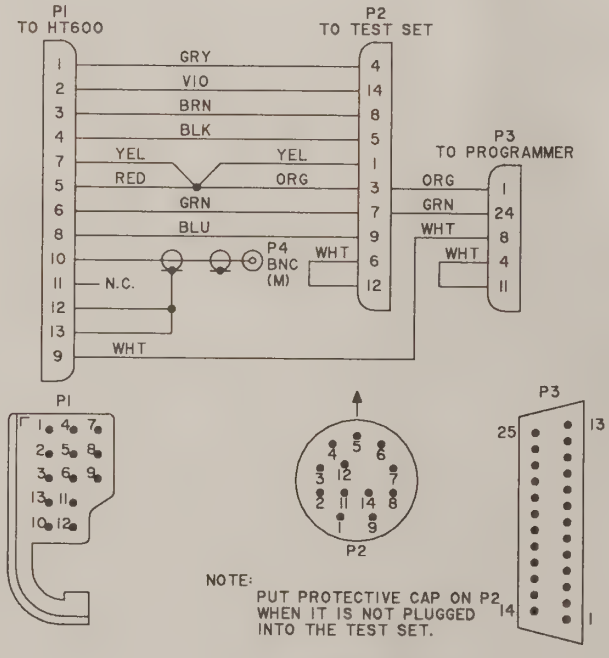


NOTE:
PINS 2 AND 7 OF P1 ARE CUT. R1 AND CR1 ARE LOCATED WITHIN THE METAL SHELL OF THE P1 CONNECTOR. R2 IS LOCATED WITHIN THE SHELL OF THE P4 CONNECTOR.

RTK-4073A



RTK-4205A



NOTE:
PUT PROTECTIVE CAP ON P2 WHEN IT IS NOT PLUGGED INTO THE TEST SET.

DEPS-44873-O
(SHEET 2 OF 2)

MOTOROLA, INC.
COMMUNICATIONS SECTOR

TEST EQUIPMENT SERVICE CENTER EAST
1308 N. Plum Grove Road Schaumburg, IL 60173

TEST EQUIPMENT SERVICE CENTER WEST
2333 B. Utah Avenue, El Segundo, CA 90245

TEST EQUIPMENT SERVICE REQUEST FORM

This completed form must accompany equipment returned for repair.

CUSTOMER'S PURCHASE ORDER NO. DATE
MODEL NUMBER SERIAL NUMBER
DESCRIPTION OF PROBLEM
REQUESTED SERVICE
SHIP TO ADDRESS
SHIP VIA

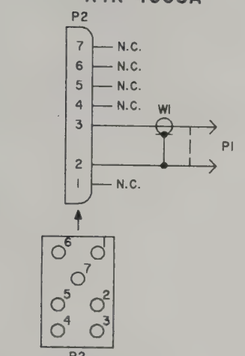
Providing the information below will reduce the turnaround time on your Test Equipment Service.

MOTOROLA CUSTOMER NUMBER	BILL TAG	SHIP TAG	INTERNAL MOTOROLA ACCOUNT NO.

SIGNED: _____

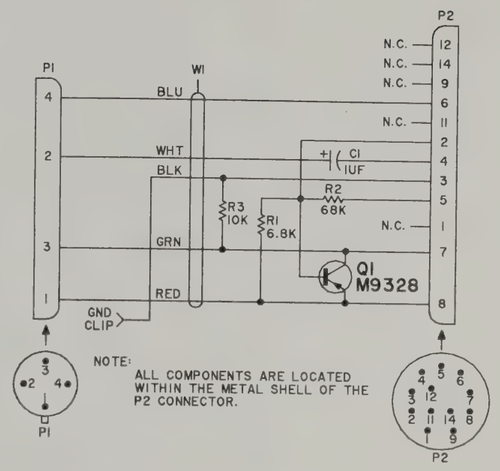
METERING/CONTROL CABLES

RTK-4003A



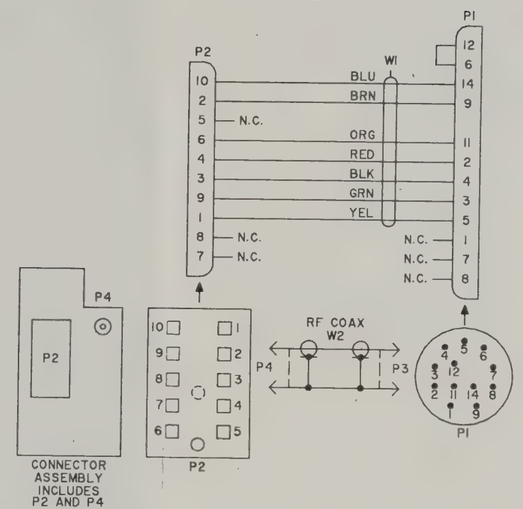
NOTE:
ALL CONNECTOR DETAILS ARE SHOWN FROM THE PIN SIDE.

RTK-4013B



NOTE:
ALL COMPONENTS ARE LOCATED WITHIN THE METAL SHELL OF THE P2 CONNECTOR.

RTK-4021A



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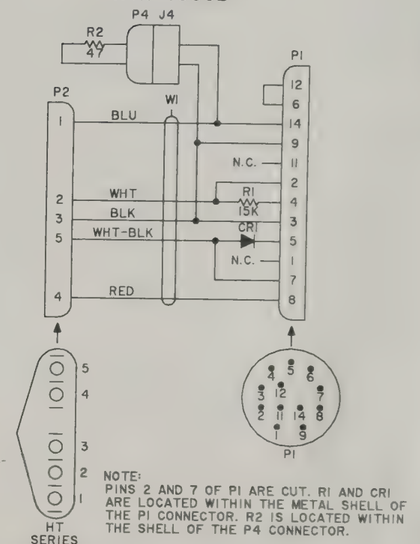
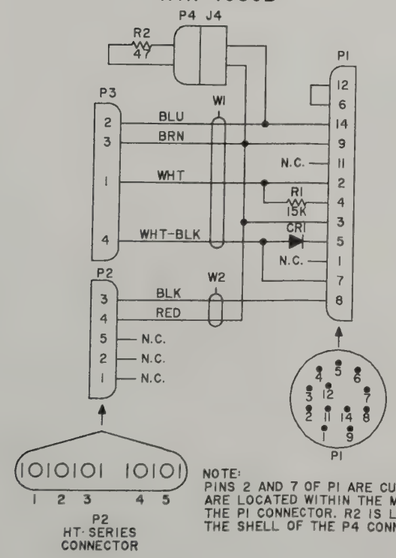


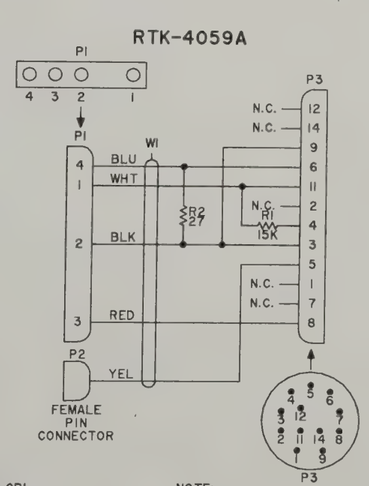
NOTE:
PINS 2 AND 7 OF P1 ARE CUT. R1 AND CR1 ARE LOCATED WITHIN THE METAL SHELL OF THE P1 CONNECTOR. R2 IS LOCATED WITHIN THE SHELL OF THE P4 CONNECTOR.

RTK-4039B



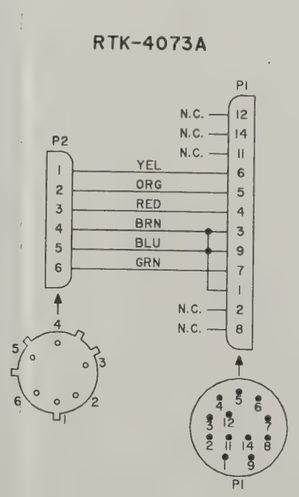
NOTE:
PINS 2 AND 7 OF P1 ARE CUT. R1 AND CR1 ARE LOCATED WITHIN THE METAL SHELL OF THE P1 CONNECTOR. R2 IS LOCATED WITHIN THE SHELL OF THE P4 CONNECTOR.

RTK-4059A



NOTE:
PIN 11 OF P3 IS CUT OFF ALL COMPONENTS ARE LOCATED WITHIN THE METAL SHELL OF THE P3 CONNECTOR.

RTK-4073A



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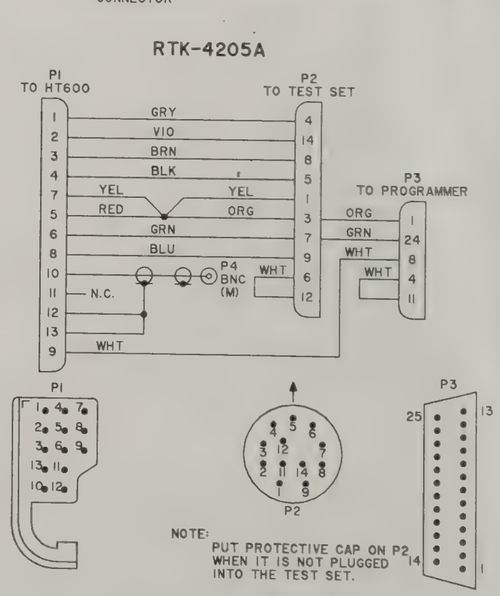

NOTE:
PUT PROTECTIVE CAP ON P2 WHEN IT IS NOT PLUGGED INTO THE TEST SET.

DEPS-44873-O
(SHEET 2 OF 2)

MOTOROLA, INC.
COMMUNICATIONS SECTOR

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